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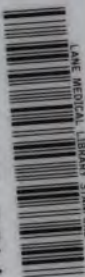
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AN

EXPERIMENTAL

STUDY OF LESIONS

ARISING FROM SEVERE CONCUSSIONS.

BY

B. A. WATSON, A.M., M.D.,

AUTHOR OF "AMPUTATIONS AND THEIR COMPLICATIONS;" SURGEON TO THE JERSEY CITY AND  
CHRIST HOSPITALS, JERSEY CITY, N. J.; FELLOW OF THE AMERICAN  
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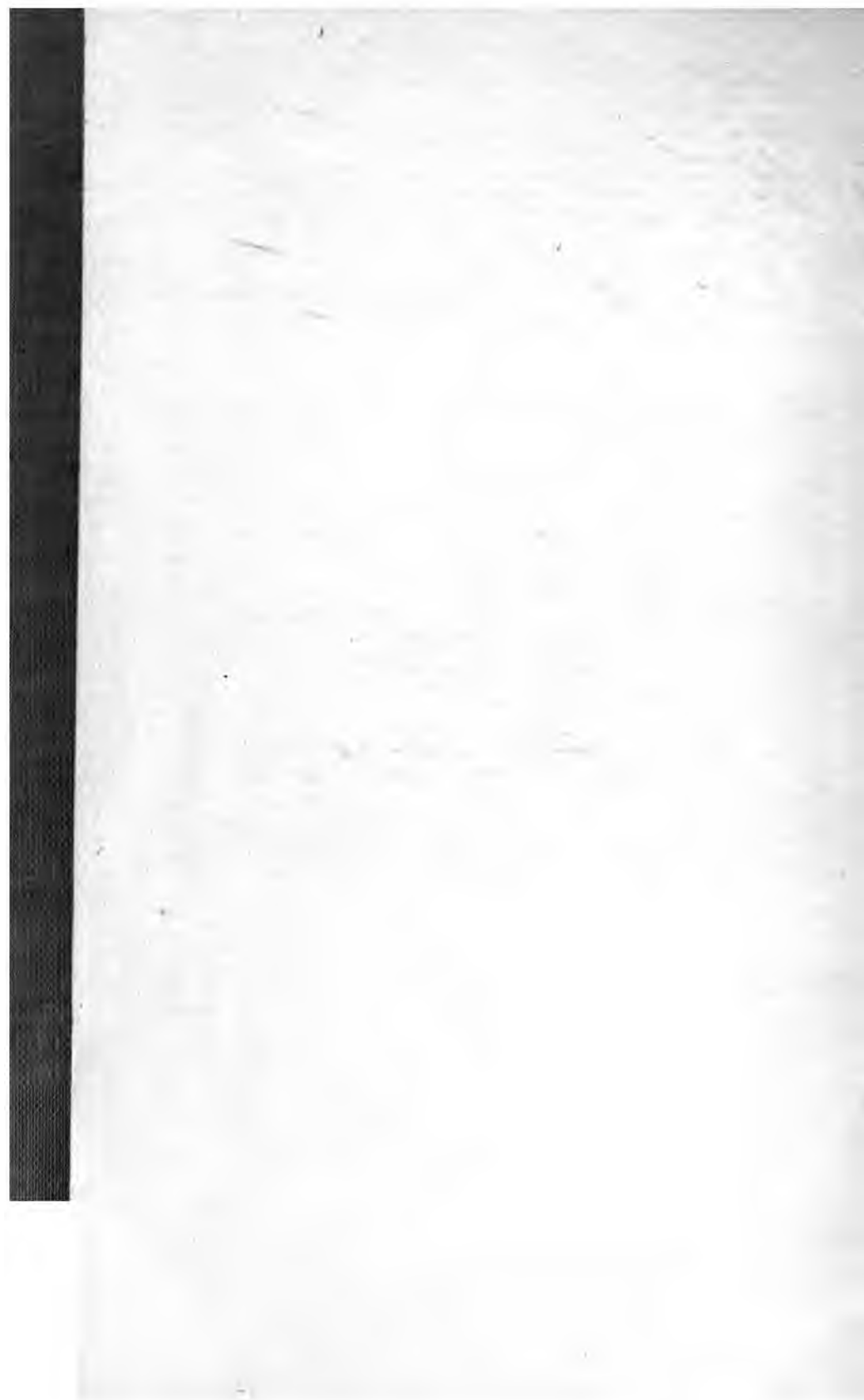
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AN

## EXPERIMENTAL STUDY OF LESIONS

### ARISING FROM SEVERE CONCUSSIONS.

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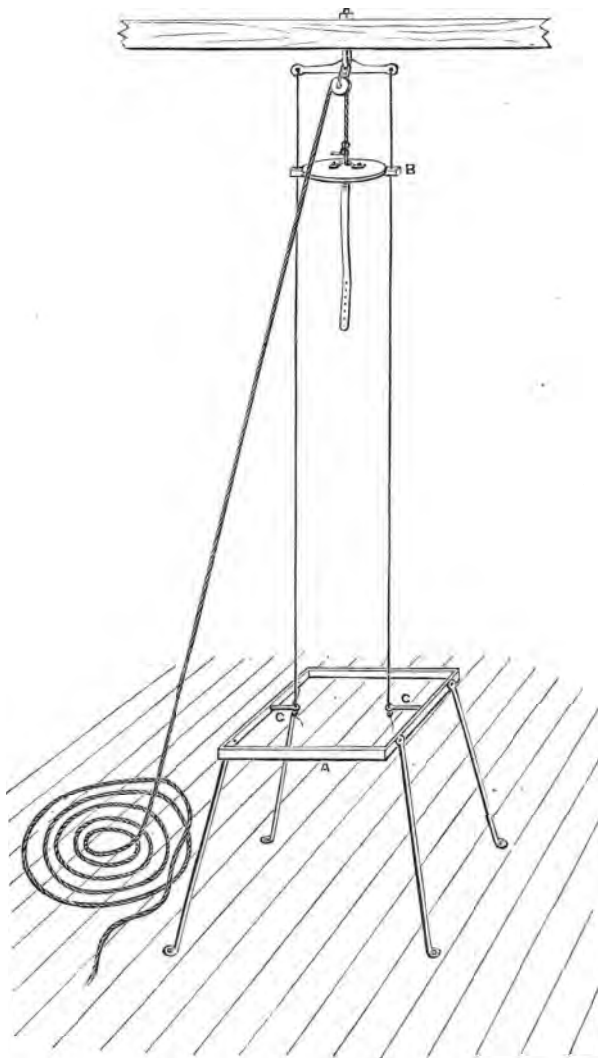
The author was prompted to undertake this laborious investigation, in order that he might add something, if possible, to our present limited and very unsatisfactory knowledge of those lesions, which have been discussed by Mr. John Eric Erichsen, LL.D., under the caption of "Concussion of the Spine, Nervous Shock, etc.," and by Herbert W. Page, M.A., M.D., under the head of "Injuries of the Spine and Spinal Cord."

Since the primary object of this experimentation was to produce lesions of the spinal cord, therefore the apparatus was arranged with especial reference to the accomplishment of this end. The dogs employed in these experiments were uniformly dropped twenty-five feet, and were so hopped in one hundred and thirty-five cases that the blow was delivered on the nates, while the spine formed a nearly perpendicular line to this point. In six other experiments the blow was received along the course of the spine, while the head of the animal was sufficiently raised to prevent it from coming in contact with the solid plank floor. The *modus operandi* pursued in these experiments will be better understood after examining the following description of the machinery employed. This apparatus is shown in Fig. 1.

The frame A, being sufficiently high to prevent the head of the animal from striking against it, consequently the dog is only bruised by striking squarely upon the floor, while the strap attached to the crossbar B is sufficiently long to enable the animal to lie in the prone position. Lumps of soft rubber are placed at C C, around the bottom of the wire, to cushion the fall of the crossbar and to prevent concussion from knocking out the brass bushings. There is placed immediately above this crossbar a tin plate about eight inches in diameter, which is slightly concavo-convex, the convexity pointing upward. This instrument is intended to act as a parachute, merely to pre-

vent the crossbar from striking the head of the dog during the fall. It was found to accomplish this purpose admirably well. This crossbar is connected by a string with a hook, attached to the pulley

FIG. 1.



cord employed to raise the animal to the desired height, and when it is desired to drop the victim, the string is cut with a sharp pair of scissors, thus preventing as far as possible any swinging motion from being

communicated to the dog. The dog having been properly hopped, is made fast to the strap attached to this crossbar, and the traumatism is quickly produced.

This method was adopted for the purpose of producing the traumatism in preference to other mechanical measures, because of its simplicity and the uniform results which would naturally follow its use.

It will here be observed that the animals employed in our experiments differed widely in weight, but were each dropped twenty-five feet. The difference in the weight of the animal would unquestionably make a difference in the momentum of the fall and the force of the blow received, but it is likewise true that under certain circumstances the vital force, or power of resistance, will in a great measure counteract the effect of the former. In other words a young dog, which by reason of its youth has not attained but one-half the weight of an older one of the same breed, would certainly possess less vital power. In explanation of our method of procedure it should be here stated that immediately prior to the dog being dropped there was always made a full record, including breed of animal, age, sex, weight, temperature, pulse, respiration and the condition of the pupils; the latter were described as normal, contracted or dilated.

It should here be observed that in every instance the primary record, including the number of the experiment, etc., is divided into two parts; the former describes the normal condition of the animal, while the latter, which follows the word "Traumatized," describes briefly the condition of the dog after he had been dropped. Commencing on the next day after these animals had been subjected to the drop, the observations relating to their general appearance, temperature and pupils were made daily, or less frequently when in our opinion this part of our programme might be safely varied. It is however proper that the reader should be here informed that daily examinations were made in all cases, except those in which the traumatism had been very slight or was entirely wanting. Furthermore, these observations were continued until the dog was killed. In fact, the last observations recorded as relating to these living animals were always made just prior to killing the dogs with chloroform.

There will be found following these reports a full description of the post-mortem and microscopical appearances. The latter were made by Dr. Frank Ferguson, Pathologist to the New York Hospital.

The study of this subject has taught us to pay marked attention to the external appearance and movements of these animals, especially after they have been subjected to the traumatism. Therefore permit me to remark that the healthy uninjured dog is always very careful in regard to his toilet. Whenever it happens that the weary hunting dog



returns to his kennel at night besmeared with dirt, he never neglects to thoroughly cleanse himself, unless ill, that he may meet his master in the early morning in the most attractive attire supplied by nature. The dogs employed for experimental purposes were kept in a kennel, the floor of which was covered with sawdust, while there were still other sources from which they were frequently soiled, and still the healthy and uninjured animals never failed for any considerable time to put themselves in a neat and presentable condition. Even a few hours after they had been dropped, when the experimenter presented himself to their vision, those not severely injured never failed to spring up in their kennel and greet their master with the most extravagant expressions of joy. But, on the contrary, the animals who remained reclining, while their coats remained soiled and filled with sawdust, who raised their heads only to show a dull and listless eye, were always found, by a thorough examination, to be more or less injured; consequently our study was carefully directed to this class. Every change in the toilet, whether for better or worse, the appearance, the movements, temperature, etc., were carefully noted. The study of this subject has convinced me that little, if any, value should be attached to either the pulsations or respirations. Who has failed to observe that a dog at one moment may lie panting rapidly, while at the next he may be breathing very slowly?

The heart's action in this animal is equally variable, and in nearly all cases is distinctly intermittent. Therefore we shall not burden the printed page by transcribing that portion of the written record which relates to the pulsations and respirations.

The post-mortem records were always written in a book kept for this purpose, while the autopsy was still progressing, and never postponed until the operation was completed. As soon as an examination was finished the various specimens intended for the microscopist were placed in the Müller's fluid contained in a glass jar. The experiments, for various reasons, will be described in two series. In the first series forty-one dogs were used, and in the second there were employed one hundred. The first experiment of the first series was made Feb. 9th, 1886, and the last of this series on June 2d of the same year. It should be added that, owing to certain annoyances, I am compelled to admit that the reports of the experiments of this series are very much less satisfactory than those of the second. The first experiment of the second series was made Jan. 10th, 1887, and the one hundredth on March 31st of the same year.



## FIRST SERIES.

Feb. 9th, 1886.

EXPERIMENT 1.—*Normal Condition*.—Mongrel; male, æt. seven months; weight ten and three-fourths pounds; temperature 102.2; pupils natural.

*Traumatized*.—The result was apparently negative.

Feb. 10th. Temperature 99.4, pupils normal.

" 11th.	"	99.5,	"	"
" 12th.	"	98.5,	"	"
" 13th.	"	96.1,	"	"
" 14th.	"	100.2,	"	"
" 15th.	"	100.7,	"	"
" 16th.	"	101.4,	"	"
" 17th.	"	98.2,	"	"
" 18th.	"	101.0,	"	"
" 19th.	"	97.1,	"	"
" 20th.	"	100.9,	"	"

*Post-mortem*.—The dog was killed with chloroform, and the examination made immediately after the last temperature was taken. Careful search showed no signs of injury or disease. Weight of brain two ounces and one hundred and eighty grains. Weight of spinal cord two hundred and eleven grains.

*Microscopical Report*.—An entire cord within the dura. Sections showed hyperæmia of the gray and white substances of the cord. The cervical canal was dilated. The canal could be seen with the unaided eye, normally lined with epithelium.

EXPERIMENT 2.—*Normal Condition*.—Mongrel; male, æt. nine months; weight thirteen and three-fourths pounds; temperature 101.0; pupils natural.

*Traumatized*.—The result was fatal.

*Post-mortem*.—There was found evidence of contusion over the rump. The thorax was opened, and the posterior mediastinal cavity was filled with blood clots. There was a rupture of the ascending aorta about three-fourths of an inch above the aortic valves. The weight of the brain and spinal cord were not recorded.

*Microscopical Report*.—Normal heart.

Feb. 9th.

EXPERIMENT 3.—*Normal Condition*.—Mongrel; male, æt. two and one-half years; weight twenty-eight and one-fourth pounds; temperature 100.8; pupils natural.

*Traumatized*.—Complete paraplegia. The hind-legs are absolutely

powerless, but the animal dragged himself, with much effort, over the floor with his fore-legs.

Feb. 10th. Temperature 101.1; pupils normal; toilet neglected; eyes dull; made no effort to move; has made none, except those already mentioned, which were not continued more than five minutes after the animal was traumatized, however; the paralysis is about the same to-day as it was yesterday. Refused food and drink.

Feb. 11th. Temperature 102.6; pupils normal; has partaken of some food, but still refused drink; condition otherwise unchanged since yesterday.

Feb. 12th. Temperature 100.0; pupils normal; condition otherwise unchanged since the last report.

Feb. 14th. Temperature 99.2; pupils normal; incontinence of urine. There is no improvement in any of the symptoms. The animal is evidently failing.

*Post-mortem.*—This examination revealed a comminuted fracture of the spinous process and body of the seventh dorsal vertebra. The spinal cord was exposed, and found to be completely crushed at this point, showing the result, likewise, of inflammatory action in the congested and softened condition, which extended in both directions away from the seat of injury one inch or more. The post-mortem condition of the parts behind the seat of injury differed in no material respect from those witnessed so commonly in the autopsies made on human subjects who have suffered from similar traumatisms. Weight of brain two ounces one hundred and eighty-two grains. Weight of cord, two hundred and sixty-nine grains.

*Microscopical Report.*—There was a break in the dorsal region of the cord. Above and below this break the cord was softened and intensely hyperæmic. The central canal was dilated with blood. The cord was intensely hyperæmic throughout. In the cervical and lower lumbar regions no special change was noticed except the hyperæmia.

Feb. 11th.

EXPERIMENT 4.—*Normal Condition.*—Mongrel; bull-male, æt. about five years; weight fifty-one and one-half pounds; temperature 102.2; pupils natural.

*Traumatized.*—The animal walked with some difficulty, apparently weakened in the hind legs; pupils were slightly dilated.

Feb. 12th. Temperature 102.0; pupils normal. The symptoms more marked to-day than yesterday. The animal stood on his hind legs with much difficulty; walked with an unsteady gait; toilet neglected; eyes dull; ate and drank; and was evidently suffering from incomplete paraplegia.



Feb. 13th. Temperature 101.0; pupils normal; some slight improvement in other respects.

Feb. 14th. Temperature 100.5; pupils normal; ate and drank fairly well.

Feb. 15th. Temperature 101.8; pupils normal.

Feb. 16th. Temperature 99.0; pupils normal. There had been some improvement in the paraplegia.

Feb. 17th. Temperature 100.6, pupils normal.

" 18th. " 100.0, " "

" 19th. " 102.0, " "

" 20th. " 100.7, " "

" 21st. " 100.0, " "

" 22d. " 101.0, " "

" 23d. " 100.8, " "

" 24th. " 101.6, " "

*Post-mortem.*—This autopsy was made promptly after the examination recorded on the twenty-fourth. There was found a simple fracture of the body of the last lumbar vertebra, external to which was a large blood clot, some part of which had evidently been absorbed, while the cauda equina showed signs of pressure from the coagulated blood, but none of an inflammatory character. There was also congestion of the cortical substance of both kidneys and the lining membrane of the bladder. Weight of brain three ounces, four hundred and twenty grains. Weight of spinal cord one ounce and thirty-five grains.

*Microscopical Report.*—The brain was incised in several places, and it was found to be moderately hyperæmic; otherwise normal. There was general hyperæmia of the cord. The ganglionic cells were less distinct than in normal cords, less defined from their surroundings. The nerve ends were less sharply defined in the anterior and posterior columns, near the median commissure, than in the rest of the cord. This was more marked in the lumbar region.

*Observations.*—It is highly important to observe that in the case of this animal the improvement was steady after the third day of the receipt of the traumatism until his death. In fact, so marked had been the progress that I am fully assured that had the dog been left to unaided nature he would have entirely recovered.

Feb. 17th.

EXPERIMENT 5.—*Normal Condition.*—Black and tan; female, æt. four years; weight ten and one-half pounds; temperature 102.0; pupils natural.

*Traumatized.*—Incomplete paraplegia; unsteady in her movements; showed the effects of the traumatism chiefly in the hind legs.

Feb. 18th. Temperature 101.5, pupils normal.

Feb. 19th. Temperature 102.0, pupils normal.

" 20th.	"	100.0,	"	"
" 21st.	"	100.2,	"	"
" 22d.	"	101.1,	"	"
" 23d.	"	100.4,	"	"
" 24th.	"	99.8,	"	"
" 26th.	"	101.4,	"	"

*Observations.*—Walked but little; gait slightly unsteady, but somewhat improved; ate and drank well; presents a neat toilet.

*Post-mortem.*—There is an increased mobility between the last lumbar vertebra and the sacrum. Careful inspection of this part showed that the ligaments of this articulation have been partially ruptured. Thoracic and abdominal viscera apparently healthy. There was found encapsulated in the posterior mediastinum a twenty-two calibre leaden bullet. The brain and cord seemed healthy, but the cauda equina showed the effects of an injury. Weight of brain two ounces, one hundred and fifty grains.

*Microscopical Report.*—None received.

Feb. 17th.

EXPERIMENT 6.—*Normal Condition.*—Black and tan; male, æt. five years; weight twenty-eight and one-fourth pounds; temperature 102.8; pupils natural.

*Traumatized.*—The result was not marked.

Feb. 18th. Temperature 102.6, pupils normal.

" 19th.	"	103.0,	"	"
" 20th.	"	101.1,	"	"
" 21st.	"	100.2,	"	"
" 22d.	"	99.8,	"	"
" 23d.	"	101.2,	"	"
" 24th.	"	98.3,	"	"

*Post-mortem.*—This examination revealed some hyperæmia of the brain and spinal cord. Weight of brain three ounces and twenty-five grains; weight of cord two hundred and twenty-three grains.

*Microscopical Report.*—The entire cord was hyperæmic. In the cervical region the cord had not taken up the staining fluid around the middle commissure and at the periphery of the horns. The fibres were less distinct and the surface of the sections were granular. The horns were also somewhat granular and the ganglionic cells were not so well defined.

Feb. 17th.

EXPERIMENT 7.—*Normal Condition.*—Mongrel; male, æt. four years; weight fifty-six pounds; temperature 103.4; pupils natural.

*Traumatized.*—Slight paraplegia; unsteady on hind legs.



Feb. 18th.	Temperature	102.0,	pupils	normal.
" 19th.	"	100.5,	"	"
" 20th.	"	98.0,	"	"
" 21st.	"	97.1,	"	"
" 22d.	"	96.0,	"	"

*Observations.*—The paraplegia was at first slight but gradually increased. The animal was dull; toilet neglected; took food and drink fairly well, but there had been some dribbling of urine several days prior to his death.

*Post-mortem.*—This examination revealed diffused hemorrhagic infarctions in various portions of both lungs. These infarctions differed much in size, some being as large or larger than a pea, while others were not larger than a pin's head. At the point where these infarctions had been most numerous there was observed a broad zone of pneumonic consolidation. There was also a rupture of some ligaments between the last lumbar and first sacral vertebræ, with crushing of the cauda equina, and a partial separation of the right os innominatum from the sacrum. The kidneys and walls of the bladder were congested. Weight of brain four ounces, one hundred and forty-six grains; weight of spinal cord four hundred and forty-four grains.

*Microscopical Report.*—There was general hemorrhage into the lung tissue. The bronchi and air spaces in the affected region were filled with blood; the vessels of the organ were everywhere intensely hyperæmic; no special vessel or bronchus could be held responsible for the hemorrhage. It was parenchymatous. The cut surface of the cord looked granular; the ends of the nerves were less distinctly seen, especially in the posterior and anterior columns near the commissure. This was especially well marked in the lumbar region; in this location the central canal was dilated, normally lined by epithelium. The cord was hyperæmic.

March 6th.

EXPERIMENT 8.—*Normal Condition.*—Mongrel shepherd; male, æt. eighteen months; temperature 101.5; pupils natural.

*Traumatized.*—Fracture of the right humerus.

March 7th. Temperature 102.2, pupils normal.

" 8th. " 102.2, " "

*Post-mortem.*—This examination was entirely negative. Weight of brain two ounces and one-half; weight of spinal cord two hundred and eighty grains.

*Microscopical Report.*—Brain normal. All the regions of the cord normal. The blood vessels in this cord, especially in the horns, seem slightly over-distended. Alterations in the cord as above recorded.

March 6th.

EXPERIMENT 9.—*Normal Condition*.—Mongrel; male, æt. two years and six months; weight forty-nine pounds; temperature 102.0; pupils natural.

*Traumatized*.—Pupils apparently dilated.

March 8th. Temperature 102.5; pupils normal.

*Observations*.—Dog is gaunt and trembling; eyes dull; coat rough; nervous.

March 8th. Temperature 102.0; pupils normal.

*Observation*.—Somewhat less nervous than yesterday.

March 9th. Temperature 102.2, pupils normal.

" 10th. " 101.8, " "

" 11th. " 101.8, " "

*Observations*.—This dog has never failed to walk about each day since he was dropped; has shown no signs of paralysis, although he has been inclined to sit down very often; seemed disinclined to stand on his feet more than a few moments at a time; coat and general appearance about the same as they were twenty-four hours after he was injured.

*Post-mortem*.—Careful examination of the abdominal and thoracic cavities, which appeared healthy to the unaided eye. Brain and spinal cord apparently normal. Increased mobility between the fifth and sixth dorsal vertebræ. Weight of brain three ounces and forty-five grains; weight of spinal cord four hundred grains.

*Microscopical Report*.—All the sections of the cord were normal. Brain normal. Kidneys intensely hyperæmic. One of the kidneys has an area in one of its Malpighian pyramids which contains so many inflammatory corpuscles that the tubes are barely distinguished. It is not an abscess, for there is no one part of it completely broken down. The outlines of the tubes were still seen. The epithelium has undergone fatty degeneration.

March 6th.

EXPERIMENT 10.—*Normal Condition*.—Mongrel; female, æt. eleven months; weight twenty-one pounds; temperature 101.8; pupils moderately dilated.

*Traumatized*.—Pupils in the same condition.

March 7th. Temperature 101.5, pupils normal.

" 8th. " 102.2, " "

" 9th. " 101.2, " "

*Post-mortem*.—Visceral organs of the thorax and abdomen healthy, with the exception of the kidneys, which are both in a state of cystic degeneration. The meninges of the brain seem to be congested. The quantity of cerebral fluid apparently somewhat increased. No softening (apparent to the unaided eye) of the brain or spinal cord. Weight of



brain two ounces and one hundred and eighty-six grains. Weight of spinal cord two hundred and seventy-six grains.

*Microscopical Report.*—Brain moderately congested. There are a few punctate hemorrhages in the anterior horns of the lumbar region of the cord. The cord is hyperæmic throughout, but less so than in Experiment 22.

March 16th.

EXPERIMENT 11.—*Normal Condition.*—Mongrel; black and tan; male, æt. one year; weight sixteen and one-half pounds; temperature 101.9; pupils natural.

*Traumatized.*—Results negative.

March 17th. Temperature 101.8, pupils normal.

“ 18th. “ 101.5, “ “

*Post-mortem.*—Removal of the skin showed numerous ecchymotic spots in the gluteal regions. In all other respects the examination was negative. Weight of brain two ounces, two hundred and eighty grains. Weight of spinal cord one hundred and ninety grains.

*Microscopical Report.*—Brain and medulla normal. All the regions of the cord revealed nothing abnormal. The blood vessels were generally well filled with blood, but not abnormally so.

March 16th.

EXPERIMENT 12.—*Normal Condition.*—Mongrel; female, æt. two years; weight forty-four pounds; temperature 104.2; pupils natural.

*Traumatized.*—No apparent injury.

March 17th. Temperature 103.2, pupils normal.

“ 18th. “ 103.2, “ “

“ 19th. “ 101.2, “ “

“ 20th. “ 102.8, “ “

“ 22d. “ 101.2, “ “

“ 23d. “ 101.5, “ “

*Post-mortem.*—The thoracic and abdominal organs are perfectly healthy. Nothing abnormal discovered in the appearance of the brain or spinal cord. Weight of brain three ounces and twenty grains. Weight of spinal cord one ounce and fifteen grains.

*Microscopical Report.*—All three regions of the cord normal. Brain normal.

March 29th.

EXPERIMENT 13.—*Normal Condition.*—Mongrel; female, æt. nine months; weight fifteen and one-half pounds; temperature 102.8; pupils natural.

*Traumatized.*—Condition unchanged.

March 30th. Temperature 103.0, pupils normal.

“ 31st. “ 102.2, “ “

April 1st. Temperature 102.2, pupils normal.

" 4th. " 106.2, " "

*Observations.*—All the symptoms in this case seem to indicate perfect health, with the exception of the high temperature.

*Post-mortem.*—This examination revealed a slight extravasation of blood into the psoas muscle, and likewise increased mobility in some of the vertebral articulations. The spinal column was laid aside for a more careful examination at some future time, but we possess no further record on the subject. Weight of brain two ounces, one hundred and twenty-six grains. Weight of spinal cord one hundred and eighty grains.

*Microscopical Report.*—I find in the gray and white substances of the spinal cord, in some places, very severe punctate hemorrhages. There are also a very few punctate hemorrhages in the brain. Brain and cord otherwise intensely congested.

March 29th.

EXPERIMENT 14.—*Normal Condition.*—Mongrel; black and tan; female, æt. four months; weight twelve and three-fourths pounds; temperature 102.2; pupils natural.

*Traumatized.*—Results apparently negative.

March 30th. Temperature 103.2, pupils normal.

" 31st. " 102.7, " "

April 1st. " 103.6, " "

" 3d. " 101.5, " "

*Observations.*—This dog has shown a strong disinclination to move about since traumatized.

*Post-mortem.*—The examination revealed a clot in the right lumbar region, which was entirely post-peritoneal. The artery supplying the right kidney was ruptured. Weight of brain two ounces. Weight of spinal cord two hundred and nineteen grains. The appearance of the kidneys was normal to the unaided eye.

*Microscopical Report.*—Epithelium of the collecting tubules exceedingly granular. Some of the tubes contain blood corpuscles, while some of the convoluted tubes likewise contain blood corpuscles. Kidneys in all other respects normal. The blood vessels everywhere distended with blood. Sections of brain, medulla, cervical, lumbar and dorsal regions normal.

March 29th.

EXPERIMENT 15.—*Normal Condition.*—Mongrel shepherd; female, æt. fifteen months; weight twenty-eight pounds; temperature 101.2; pupils natural.

*Traumatized.*—No immediate change observed. Two hours later the dog walked very badly; did not use the left hind leg.



March 30th. Temperature 102.4, pupils normal.

" 31st. " 103.0, " "

April 1st. " 103.0, " "

*Post-mortem.*—The only lesions observed during this examination were a number of lacerations involving the lobulus Spigelii, lobulus quadratus, while there was also found in the pelvic cavity a large blood clot. The lacerations of the liver are quite superficial and covered with blood coagula and effused serum. The pelvic clot was firm and as large as an English walnut, and seated over the lower portion of the psoas muscle, which contained several ecchymotic points. The source of this hemorrhage was not determined. Weight of brain two ounces, two hundred and forty-five grains. Weight of spinal cord two hundred and eighty-six grains. Both brain and cord seemed perfectly healthy.

*Microscopical Report.*—Wanting.

March 29th.

EXPERIMENT 16.—*Normal Condition.*—Mongrel; female, æt. one year; weight eighteen and one-half pounds; temperature 102.7; pupils natural.

*Traumatized.*—No immediate effect observed.

March 30th. Temperature 102.2, pupils normal.

" 31st. " 102.2, " "

April 1st. " 102.2, " "

" 3d. " 102.3, " "

*Observations.*—This dog, the day following traumatization showed a strong disinclination to move about, although he ate and drank well.

*Post-mortem.*—This examination revealed a slight ecchymosis in the anterior mediastinum. Inspection of the abdominal viscera failed to show any lesion, although the bladder was distended with urine, and the rectum with fæces. There was likewise observed an increased mobility between the last lumbar and the first sacral vertebræ. The cauda equina and likewise the spinal cord in the vicinity of this lesion appeared to be considerably congested. Weight of brain two ounces, one hundred and sixty-five grains. Brain and its membranes apparently healthy. Weight of spinal cord two hundred and eighty grains.

*Microscopical Report.*—Brain normal. Cord intensely hyperæmic. There is blood in the perivascular spaces in the gray matter. There are in the lumbar and cervical regions extensive punctate hemorrhages. Most of the ganglion cells appear healthy, but some of them are very granular and not well defined.

March 29th.

EXPERIMENT 17.—*Normal Condition.*—Mongrel; male, æt. fifteen months; weight twenty-nine pounds; temperature 102.5; pupils natural.

*Traumatized.*—Marked opisthotonos. Pupils normal. Sighing respirations. Died ten minutes after the injury.

*Post-mortem.*—The examination was made immediately after the death of the animal. This inspection revealed within the thoracic cavity a rupture of the arch of the aorta. Rupture, also, of the pericardium. There was also an extensive rupture of the right lobe of the liver. Both brain and spinal cord apparently uninjured. Weight of brain two and one-half ounces and sixteen grains. Weight of spinal cord two hundred and nineteen grains.

*Microscopical Report.*—Brain and all three regions of the spinal cord normal. There are punctate hemorrhages in the heart.

March 29th.

EXPERIMENT 18.—*Normal Condition.*—Mongrel; male, æt. one year and six months; weight twenty-five pounds; temperature 103.5; pupils natural.

*Traumatized.*—No apparent result.

March 30th. Temperature 103.2, pupils normal.

“ 31st. “ 103.2, “ “

April 1st. “ 102.4, “ “

“ 3d. “ 102.5, “ “

*Post-mortem.*—The examination of the thoracic and abdominal cavities revealed nothing abnormal, except within the pelvis, where there was found a large quantity of extravasated blood which was firmly coagulated. This coagulum evidently came from some ruptured blood vessel situated near the spine. Brain and cord apparently healthy. Weight of brain two ounces and two hundred and fifty grains. Weight of spinal cord two hundred and forty-five grains.

*Microscopical Report.*—There were many sections of the cord examined, but there was only revealed a single punctate hemorrhage in one of the anterior horns. In all the regions of the cord the vessels were found comfortably filled with blood. The medulla and brain were normal.

March 29th.

EXPERIMENT 19.—*Normal Condition.*—Mongrel; female, æt. one year; weight eleven and one-half pounds; temperature 102.4; pupils natural.

*Traumatized.*—There were no injurious effects perceptible immediately after the fall, but about two hours later it was observed that the dog walked with much difficulty, while his gait was very unsteady.

March 30th. Temperature 101.5, pupils normal.

“ 31st. “ 102.0, “ “

April 1st. “ 102.6, “ “



*Post-mortem.*—The result of this examination was negative. Weight of brain two ounces. Weight of spinal cord two hundred grains.

*Microscopical Report.*—Sections of the brain, the medulla, cervical, dorsal and lumbar regions of the cord were normal in every respect. April 8th.

EXPERIMENT 20.—*Normal Condition.*—Mongrel black and tan; male, æt. one year; weight eleven pounds; temperature 104.0; pupils natural.

*Traumatized.*—Death immediately followed.

*Post-mortem.*—This examination revealed a rupture of the abdominal aorta immediately behind the diaphragm, and likewise two extensive lacerations of the left lobe of the liver. The abdomen was greatly distended with blood. Weight of brain two ounces, one hundred and twenty-five grains. Weight of spinal cord one hundred and ninety grains.

*Microscopical Report.*—There were hemorrhages of very small size into the gray matter of the spinal cord. No other lesions of the brain or spinal cord.

April 8th.

EXPERIMENT 21.—*Normal Condition.*—Mongrel Scotch-terrier; male, æt. two years; weight nine and one-fourth pounds; temperature 107.8; pupils natural.

*Traumatized.*—No immediate appearance of injury, but about twenty minutes later the dog limped and dragged his right hind leg; no bones broken.

April 9th. Temperature 103.4, pupils normal.

" 10th.	"	103.2,	"	"
" 11th.	"	102.7,	"	"
" 12th.	"	101.7,	"	"
" 13th.	"	102.4,	"	"

*Post-mortem.*—This examination was entirely negative. Weight of brain one ounce, three hundred and eighty-five grains. Weight of spinal cord one hundred and fifty grains.

*Microscopical Report.*—Brain and spinal cord normal.

April 8th, 2 P. M.

EXPERIMENT 22.—*Normal Condition.*—Mongrel; male, æt two years; weight twenty-two pounds; temperature 101.8; pupils natural.

*Traumatized.*—The animal remained immovable and unconscious four minutes; the pupils were dilated and the breathing shallow. Nine minutes after the receipt of the injury the dog got up and walked unsteadily across the laboratory and fell slowly; the animal at this time, although unable to get up, was apparently conscious. Respiration sighing, while saliva was flowing freely. One hour after the animal

was traumatized he arose again, walked unsteadily across the floor of the laboratory, coughed spasmodically two or three times, ejecting with effort thick, bloody sputa.

*Second Examination.*—April 8th, 8 P. M.

This dog when first placed on the table expectorated a large quantity of bright red blood mixed with frothy mucus. There was a very marked dyspnoea and the pupils were somewhat dilated.

April 9th. Dog died at noon to-day.

*Post-mortem* was made two hours after death. There were found several deep lacerations of the lungs and likewise numerous hemorrhagic infarctions. The left lung completely solidified. Liver filled with hemorrhagic infarctions. Weight of brain two ounces, one hundred and thirty-six grains. This organ, to the unaided eye, is apparently healthy. Weight of spinal cord three hundred and fifteen grains. The anterior surface of the cord is ecchymosed throughout its entire length.

*Microscopical Report.*—Brain intensely hyperæmic, otherwise normal. Every portion of the cord intensely hyperæmic. There were punctate hemorrhages in the dorsal and cervical regions of the spinal cord, in both the anterior and posterior horns, also in the middle commissure.

April 12th.

EXPERIMENT 23.—*Normal Condition.*—Mongrel; female, æt. one year; weight seventeen pounds; temperature 102.2; pupils natural.

*Traumatized.*—Labored breathing.

April 13th. Temperature 101.2, pupils normal.

*Observations.*—There is a marked dyspnoea. Conjunctivitis with a muco-purulent secretion in both eyes.

April 14th. Temperature 102.0, pupils normal.

" 15th. " 102.5, " "

" 16th. " 102.2, " "

" 17th. " 101.8, " "

*Post-mortem.*—This examination revealed the following lesions: Two lacerations in the lobulus quadratus, also a deep laceration in the apex of the left lung, which communicates freely with the left pleural cavity. This cavity is fully distended with air. There are likewise numerous hemorrhagic infarctions in both lungs. The lower lobe of the left lung is solid and shrunken. Weight of brain two ounces, two hundred and fourteen grains. Weight of spinal cord two hundred and thirty-four grains.

*Microscopical Report.*—The brain and spinal cord intensely congested. There are small hemorrhages into the gray matter in all three regions of the cord.

April 12th.

EXPERIMENT 24.—*Normal Condition*.—Mongrel black and tan; male, æt. two years and six months; weight twenty-three pounds; temperature 102.0; pupils natural.

*Traumatized*.—Considerable dyspnœa; coughing up a bloody mucus.

April 13th. Temperature 101.4, pupils normal.

“ 14th. “ 102.0, “ “

“ 15th. “ 102.4, “ “

“ 17th. “ 101.5, “ “

*Post-mortem*.—This examination revealed extensive hemorrhagic infarctions in both lungs. The other organs in the thoracic and abdominal cavities apparently normal. Weight of brain two ounces, one hundred and eighty grains. Weight of spinal cord one hundred and seventy grains. Both organs seemed perfectly healthy when examined with the unaided eye.

*Microscopical Report*.—Wanting.

April 12th.

EXPERIMENT 25.—*Normal Condition*.—Mongrel; male, æt. ten months; weight fifteen pounds; temperature 103.2; pupils natural.

*Traumatized*.—A slight dyspnœa.

April 13th. Temperature 104.6, pupils normal.

“ 14th. “ 103.0, “ “

“ 15th. “ 103.6, “ “

“ 16th. “ 103.0, “ “

*Post-mortem*.—This examination revealed extensive hemorrhagic infarctions in the lung. All the other organs seem healthy to the unaided eye. Weight of brain two ounces, two hundred and ten grains. Weight of spinal cord two hundred and twenty grains.

*Microscopical Report*.—Brain normal. Spinal cord examined in the cervical, dorsal and lumbar regions; some of the vessels in the gray matter show blood in the perivascular spaces.

April 9th.

EXPERIMENT 26.—*Normal Condition*.—Bull-dog; male, æt. two years; weight twenty-one and one-fourth pounds; temperature 101.6; pupils natural.

*Traumatized*.—The animal remained a few minutes in a perfectly quiet state, then arose with some difficulty and walked across the laboratory floor. There is a want of coördination in the hind legs. The right hind leg is apparently the one most injured. Pupils are dilated.

April 10th. Temperature 102.5, pupils normal.

“ 11th. “ 102.2, “ “

April 12th, Temperature 101.3, pupils normal.

" 13th, " 101.0, " "

*Observations.*—This dog had been gradually improving, and made his escape after the last examination by jumping over a board fence which was five feet, six inches in height.

April 10th.

EXPERIMENT 27.—*Normal Condition.*—Mongrel; male, æt. two years; weight thirty-two and one-fourth pounds; temperature 100.8; pupils natural.

*Traumatized.*—The result negative.

April 12th. Temperature 101.2, pupils normal.

" 13th. " 101.8, " "

" 14th. " 101.8, " "

" 15th. " 102.0, " "

" 21st. " 101.6, " "

*Post-mortem.*—This examination entirely failed to reveal any lesions. Weight of brain two ounces four hundred and eighty grains. Weight of spinal cord four hundred and ten grains.

*Microscopical Report.*—Sections of the cord in the medullary, cervical, dorsal and lumbar regions revealed no lesions. Brain normal. Blood vessels were well filled in both brain and cord.

April 10th.

EXPERIMENT 28.—*Normal Condition.*—Mongrel; male, æt. three years; weight twenty-four and one fourth pounds; temperature 102.2; pupils natural.

*Traumatized.*—The result was apparently negative.

April 12th. Temperature 101.6, pupils normal.

" 13th. " 102.2, " "

" 14th. " 102.0, " "

" 15th. " 104.8, " "

" 16th. " 105.0, " "

" 22d. " 102.0, " "

*Post-mortem.*—This examination showed hemorrhagic infarctions in various parts of both lungs. The upper lobe of the right lung is in a state of passive pneumonic hepatization. Weight of brain two ounces, three hundred grains. Weight of spinal cord three hundred and sixty-six grains.

*Microscopical Report.*—Careful examination of sections of the medulla, cervical, dorsal and lumbar regions showed these parts to be entirely normal. Brain likewise normal.

April 14th.

EXPERIMENT 29.—*Normal Condition.*—Mongrel; male, æt. five months; weight fifteen pounds; temperature 103.6; pupils natural.



*Traumatized.*—Result immediate death.

*Post-mortem.*—This examination revealed a rupture in each cardiac ventricle. The thoracic cavity was distended with blood. The organs in the abdominal cavity were normal. Weight of brain two ounces, three hundred and thirty grains. This organ, to the unaided vision, seems perfectly normal. Weight of spinal cord two hundred and ten grains. The cord also was apparently normal.

*Microscopical Report.*—Wanting.

April 14th.

EXPERIMENT 30.—*Normal Condition.*—Mongrel-bull; male, æt. five months; weight twenty pounds; temperature 103.2; pupils natural.

*Traumatized.*—Result apparently negative.

April 15th. Temperature 103.3, pupils normal.

“ 16th. “ 102.4, “ “

*Post-mortem.*—The organs in the abdominal cavity were perfectly normal, while the lungs exhibited widely-diffused hemorrhagic infarctions, which were complicated in the upper left lobe with pneumonia. Weight of brain two ounces, one hundred and forty grains. Weight of spinal cord one hundred and eighty grains.

*Microscopical Report.*—The brain was hyperæmic, but otherwise normal. Spinal cord perfectly normal in all its parts.

May 17th.

EXPERIMENT 31.—*Normal Condition.*—Mongrel; female, æt, one year; weight twenty pounds; temperature 102.8; pupils natural.

*Traumatized.*—The result was apparently negative.

May 18th. Temperature 102.6, pupils normal.

“ 19th. “ 103.0, “ “

“ 20th. “ 101.0, “ “

*Post-mortem.*—This examination revealed a considerable laceration of a lobe of the liver. The wound and the adjacent omentum were covered with an adherent blood clot. Numerous hemorrhagic infarctions were disseminated throughout the lung, and about one-half of the middle lobe of the left lung was in a state of hepatization. The other organs of the thoracic and abdominal cavities were apparently healthy. The brain and spinal cord likewise seemed normal. Weight of brain one ounce, four hundred and eighty grains. Weight of spinal cord two hundred grains.

*Microscopical Report.*—The brain was normal. The vessels, especially in the gray matter of the cord, were well distended. There were blood cells, in a few sections, in the perivascular spaces. The veins were more distended than the arteries.

May 17th.

EXPERIMENT 32.—*Normal Condition.*—Black and tan; female, æt.

fifteen months; weight nine pounds; temperature 104.2; pupils natural.

*Traumatized.*—The result was apparently negative.

May 18th. Temperature 102.4, pupils normal.

“ 19th. “ 101.6, “ “

“ 20th. “ 102.8, “ “

“ 21st. “ 105.0, “ “

*Post-mortem.*—This examination revealed the following lesions: Indications of contusion, extravasation of blood, etc., over the sacral region where the animal struck when dropped; rupture of a blood vessel within the pelvic cavity, in the left sacro-iliac region, with infiltration of the cellular tissue; diffused hemorrhagic infarctions in both lungs, right hepatized; all other organs normal.

*Microscopical Report.*—All three regions of the cord normal. Brain normal.

May 17th.

EXPERIMENT 33.—*Normal Condition.*—Mongrel Spitz dog; male, æt. four months; weight thirteen pounds; temperature 102.6; pupils natural.

*Traumatized.*—This animal seemed to have been quite severely injured; walked with an unsteady gait.

May 18th. Temperature 102.0, pupils natural.

*Observations.*—The dog walked better to-day than yesterday, but still seemed to be very ill. Toilet neglected, etc.

May 19th. Temperature 102.6, pupils normal.

“ 20th. “ 103.8, “ “

*Post-mortem.*—This examination revealed the following lesions: General hemorrhagic infarctions in both lungs; extensive hepatization in the same; rupture of some small veins at the base of the neck, accompanied with a hemorrhage into the subcutaneous cellular tissue, equaling the size of a silver dollar. Weight of brain two ounces and sixty-four grains. Weight of cord one hundred and sixty-five grains.

*Microscopical Report.*—All the sections of the cord and brain normal.

May 28th.

EXPERIMENT 34.—*Normal Condition.*—Fox-hound; female, æt. two years; weight twenty-three pounds; temperature 103.4; pupils natural.

*Traumatized.*—Apparently negative results.

May 29th. Temperature 102.6, pupils normal.

“ 30th. “ 103.0, “ “

“ 31st. “ 102.6, “ “

*Post-mortem.*—This examination revealed the following lesions: A contusion over the posterior dorsal region; a few hemorrhagic infarctions in the lungs, with more or less hepatization of the same.



This dog had been so dropped as to receive the force of the fall along the line of the posterior part of the spine instead of on the nates.

The brain was apparently normal, and its weight was two ounces, two hundred and ninety-three grains. Weight of spinal cord two hundred and fifty-nine grains.

*Microscopical Report.*—Brain normal. All the sections of the cord were normal. The vessels were well distended with blood, especially in the gray matter.

May 28th.

EXPERIMENT 35.—*Normal Condition.*—Water-spaniel; female, æt. two years and six months; weight thirty-four pounds; temperature 102.4; pupils natural.

*Traumatized.*—This dog died two minutes and one-half after she was dropped.

*Post-mortem.*—This examination was made immediately and revealed the following lesions: Rupture of the right auricle and the left pulmonary artery; laceration of the left lobe of the liver. There were marks of contusion, with some extravasation of blood over the sacral region. The brain and spinal cord appeared to the unaided eye to be normal. Weight of brain three ounces and twenty grains. Weight of spinal cord two hundred and twenty grains.

*Microscopical Report.*—Brain normal. There were small hemorrhages in the gray matter of the cord in all the regions examined. These were very small; one of them was seen in side section.

May 31st.

EXPERIMENT 36.\*—*Normal Condition.*—Mongrel; female, æt. one year; weight twenty-seven and one-fourth pounds; temperature 102.5; pupils natural.

*Traumatized.*—Result apparently negative.

June 1st. Temperature 101.8, pupils normal.

“ 2d. “ 101.7, “ “

“ 5th. “ 105.0, “ “

*Observations.*—This animal died June 20th. She had been suffering about fifteen days with the mange, and it was not believed that the traumatism was either a direct or indirect cause of death.†

EXPERIMENT 37.—*Normal Condition.*—Scotch-terrier; male, æt. seven years; weight twenty and three-fourths pounds; temperature 102.0; pupils natural.

\* In the five remaining experiments of this series the dogs were so hopped that the force of the blow was received along the course of the spine, instead of being delivered on the nates.

† The interference with my work by the Society for the Prevention of Cruelty to Animals interrupted my observations in this case and in the balance of this series.

*Traumatized.*—The result was apparently negative.

June 1st. Temperature 103.2, pupils normal.

“ 2d. “ 103.0, “ “

Dec. 4th, 1886. “ 102.0, “ “

*Post-mortem.*—This examination was not made until the last date, and was therefore so remotely connected with the traumatism as to possess no interest.

June 2d.

EXPERIMENT 38.—*Normal Condition.*—Mongrel hound; male, æt. one year; weight twenty-two pounds; temperature 103.2; pupils normal.

*Traumatized.*—Negative result.

June 3d. Temperature 105.0, pupils normal.

“ 5th. “ 102.2, “ “

Dec. 13th, 1886. “ 101.8, “ “

*Observations.*—The remarks made in regard to the autopsy in Experiment 37 are applicable to the balance of the first series.

June 2d.

EXPERIMENT 39.—*Normal Condition.*—Black and tan; female, æt. one year; weight fourteen and three-fourths pounds; temperature 103.0; pupils natural.

*Traumatized.*—Apparently unhurt.

June 3d. Temperature 103.0, pupils normal.

“ 5th. “ 101.0, “ “

Dec. 8th, 1886. “ 101.8, “ “

*Post-mortem.*—Vomiting

June 2d.

EXPERIMENT 40.—*Normal Condition.*—Mongrel-bull; female, æt. twenty months; weight twenty-two pounds; temperature 102.4; pupils natural.

*Traumatized.*—The result was apparently negative.

June 3d. Temperature 104.0, pupils normal.

“ 5th. “ 103.0, “ “

This animal died July 28th, 1886, from mange, after having the disease more than two months.

June 2d.

EXPERIMENT 41.—*Normal Condition.*—Mongrel fox hound; male, æt. three years; weight fifty and three-fourths pounds; temperature 102.0; pupils natural.

*Traumatized.*—The blood flowed from the nostrils and the walk of the animal was very unsteady.

June 3d. Temperature 103.8, pupils normal.

“ 5th. “ 103.0, “ “



Jan. 7th, 1887. Temperature 102.2, pupils normal.

*Post-mortem.*—This examination revealed no lesions. Weight of brain three ounces and three hundred grains. Weight of spinal cord four hundred and thirty grains.

## SECOND SERIES.

Jan. 10th, 1887.

EXPERIMENT 1.—*Normal Condition.*—Mongrel; female, æt. five months; weight seven and one-half pounds; temperature 102.1; pupils natural.

*Traumatized.*—The result was apparently negative.

Jan. 11th. Temperature 102.0, pupils normal.

“ 12th. “ 102.2, “ “

“ 13th. “ 102.2, “ “

“ 14th. “ 101.5, “ “

“ 15th. “ 100.8, “ “

“ 16th. “ 101.0, “ “

*Post-mortem.*—This examination revealed the following lesions: A slight laceration of one of the smaller lobes of the liver, with a slight congestion of both kidneys. The membranes of the brain were congested; covered in a few spots with inflammatory exudation, while the spinal cord was apparently normal. Weight of brain one ounce, four hundred and eleven grains. Weight of spinal cord one hundred and sixty-five grains.

*Microscopical Report.*—The pia mater was intensely hyperæmic; the brain was otherwise normal. The cord was hyperæmic, but there was no other change.

Jan. 10th.

EXPERIMENT 2.—*Normal Condition.*—Mongrel shepherd; female, æt. about eighteen months; weight twenty-seven pounds; temperature 102.4, pupils natural.

*Traumatized.*—Paraplegia.

Jan. 11th. Temperature 102.2, pupils slightly dilated.

“ 12th. “ 103.5, “ “ “

“ 13th. “ 102.6, “ “ “

“ 14th. “ 102.4, “ normal.

“ 15th. “ 102.9, “ “

*Post-mortem.*—This examination revealed the following: A simple fracture in the body of a vertebra, in the upper half of the lumbar region; the injury to the spinal cord was very marked at this point. There was likewise found within the peritoneal cavity about two ounces of coagulated blood directly over the psoas muscles; these

muscles were ecchymosed, the right more than the left. Both kidneys were congested. Meninges of the brain congested, especially over the occipital region; spinal cord in a similar condition. Weight of brain two ounces, one hundred and forty grains. Weight of spinal cord three hundred and sixty-six grains.

*Microscopical Report.*—Brain intensely hyperæmic, otherwise normal. The cord was hyperæmic throughout. It had not hardened well and the outlines of the fibres were indistinct, whether cut longitudinally or transversely. The ganglionic cells were perfectly distinct.

Jan. 10th.

EXPERIMENT 3.—*Normal Condition.*—Mongrel; female, æt. four years; weight twenty-three pounds; temperature 101.8; pupils natural.

*Traumatized.*—There was now paraplegia and the pupils were dilated.

Jan. 11th. Temperature 103.1, pupils normal.

“ 12th. “ 102.0, “ “

“ 13th. “ 101.4, “ slightly dilated.

*Post-mortem.*—This examination revealed the following: An ecchymosis extending from the last cervical vertebra to the first lumbar, on the right of the spine. The bladder was distended with urine, and there was also some congestion of the right kidney. The meninges of the brain were distinctly congested over the posterior portion of the left hemisphere. The membranes of the cord were likewise congested throughout the whole of the dorsal and lumbar regions. The weight of the brain was two ounces, three hundred and eleven grains. Weight of spinal cord two hundred and ninety-six grains.

*Microscopical Report.*—The brain was moderately congested; otherwise normal. The veins of the cord were filled throughout with blood; they were over-distended in places. There were no hemorrhages and the cells and nerve fibres appeared normal.

Jan. 10th.

EXPERIMENT 4.—*Normal Condition.*—Mongrel; male, æt. eight years; weight sixty pounds; temperature 102.2; pupils natural.

*Traumatized.*—Paraplegia and dilated pupils.

Jan. 11th. Temperature 102.2, pupils normal.

“ 12th. “ 103.2, “ “

*Observations.*—The paraplegia, immediately after the receipt of the traumatism, was more marked than on any other day during the life of the dog. Paraplegia incomplete.

*Post-mortem.*—This examination revealed the following lesions: A rupture of the ligaments between the last lumbar and the first sacral vertebrae, deep and extensive ecchymoses over the entire post-sacral



and right lumbar regions, a profuse extravasation of blood into the abdominal cavity, marked engorgement of the kidneys. Brain apparently normal, slight increase of cerebro-spinal fluid in the cavities, and the cord was congested up to the middle of the dorsal region. Weight of brain three ounces and forty-three grains. Weight of spinal cord one ounce and eighty grains. This lesion involved the cauda equina and not the cord.

*Microscopical Report.*—The vessels of the brain were hyperæmic. The cord had been divided longitudinally and crushed, and was too soft to be examined.

Jan. 10th.

EXPERIMENT 5.—*Normal Condition.*—Mongrel-terrier; female, æt. three years; weight twenty-one pounds; temperature 102.8; pupils natural.

*Traumatized.*—Incomplete paraplegia; pupils moderately dilated.

Jan. 11th. Temperature 103.3, pupils slightly dilated.

“ 12th. “ 103.1, “ “ “

“ 13th. “ 101.8, “ dilated.

“ 14th. “ 101.7, “ “

*Post-mortem.*—This examination revealed the following lesions: Congestion of both kidneys; in the pelvic cavity there was a quantity of extravasated blood, a deep ecchymosis involving the whole of the left psoas muscle, marked congestion of the meninges covering the vertex of the brain and a slight congestion over other portions, the brain itself somewhat hyperæmic, cranial fluid increased in quantity. The spinal cord was likewise hyperæmic. A comminuted fracture of the body of the last lumbar vertebra and the presence of a blood clot within the canal at this point. Weight of brain two ounces and sixty grains. Weight of spinal cord two hundred and sixty grains.

*Microscopical Report.*—The material was not received.

Jan. 10th.

EXPERIMENT 6.—*Normal Condition.*—Mongrel; female, æt. four years; weight twenty pounds; temperature 102.5; pupils natural.

*Traumatized.*—Result negative.

Jan. 11th. Temperature 102.4, pupils normal.

“ 12th. “ 102.2, “ “

“ 13th. “ 101.7, “ “

“ 14th. “ 101.2, “ “

“ 15th. “ 101.3, “ “

“ 17th. “ 101.4, “ “

*Post-mortem.*—This examination revealed the following lesions: Congestion of the meninges of the brain with slight inflammatory exudation; vessels somewhat over-distended; the spinal cord appeared

to be slightly congested in the lumbar region. Weight of brain two ounces, one hundred and twenty-five grains. Weight of spinal cord three hundred and twenty-three grains.

*Microscopical Report.*—The vessels of the brain and cord were distended with blood. They were otherwise normal.

Jan. 10th.

EXPERIMENT 7.—*Normal Condition.*—Mongrel; male, æt. two years; weight twenty-one pounds; temperature 102.6; pupils natural.

*Traumatized.*—Results negative.

Jan. 11th. Temperature 103.1, pupils normal.

“ 12th. “ 102.2, “ “

“ 13th. “ 101.4, “ “

“ 14th. “ 101.7, “ “

“ 15th. “ 101.5, “ “

“ 17th. “ 102.2, “ “

“ 18th. “ 102.3, “ “

*Post-mortem.*—This examination revealed the following lesions: The meninges of the brain were slightly adherent to the skull over the anterior portion of the middle lobes, and seemed to be slightly congested at this point. Weight of brain two ounces and three hundred grains. Weight of spinal cord three hundred and five grains.

*Microscopical Report.*—Brain was normal. The vessels of the gray matter of the cord were dilated with blood, and there were a very few punctate hemorrhages. The ganglion cells and nerve fibres appeared normal.

Jan. 25th.

EXPERIMENT 8.—*Normal Condition.*—Mongrel black and tan; male, æt. one year; weight twenty-three pounds; temperature 102.4; pupils natural.

*Traumatized.*—The animal walked with an unsteady gait, while one pupil was dilated and the other appeared to be contracted.

Jan. 26th. Temperature 102.2, pupils normal.

“ 27th. “ 102.3, “ “

“ 28th. “ 101.4, “ “

“ 31st. “ 102.4, “ “

*Post-mortem.*—This examination revealed the following lesions: Hemorrhagic infarctions in the left lung; the left kidney moderately congested; meninges of the brain slightly hyperæmic; along the longitudinal fissure a few drops of blood had been extravasated at one point. The spinal cord appeared perfectly healthy, and likewise the brain substance. Weight of brain two ounces, two hundred and twenty-six grains. Weight of spinal cord two hundred and eighty-one grains.

*Microscopical Report.*—Brain congested. There were hemorrhages



of small size into the gray matter of the cord. The vessels everywhere were congested. There was some blood pigment along the vessels. The nerve-ends were less distinct at the periphery of the cord. No special change noticed in the ganglion cells.

Jan. 25th.

EXPERIMENT 9.—*Normal Condition*.—Mongrel; male, æt. one year; weight seventeen pounds; temperature 102.4; pupils natural.

*Traumatized*.—Not inclined to walk. Limp, when he does walk, on the left hind leg. Pupils normal.

Jan. 26th. Temperature 101.8, pupils normal.

*Post-mortem*.—This examination revealed the following lesions: Three superficial lacerations on the posterior surface of the liver, covered with a blood coagulum of considerable size; well-marked ecchymoses of the right psoas muscle; considerable ecchymoses in the connective tissue in front of the last lumbar vertebra; bladder distended with urine, and well-marked congestion of the kidneys. The removal of the integument covering the sacral and lumbar regions revealed a deep ecchymoses in these parts. The meninges of the brain appeared to be slightly congested, but the brain was normal. There were found adherent to the meninges of the spinal cord, in the whole lumbar region, a few blood coagula, while the tissues more directly surrounding these blood clots were slightly ecchymosed. A careful examination of the spinal column in this region showed an increased mobility in the vertebral articulations, which was unquestionably due to a stretching of ligaments. Weight of brain two ounces and three hundred grains. Weight of cord two hundred and forty-three grains.

*Observations*.—It was observed after this animal had been traumatized that every attempt at movement was attended with pain which caused the animal to cry out.

*Microscopical Report*.—Brain was normal. The cord was stained with carmine, but the periphery had not taken up the staining fluid. The structure and vascular supply of the cord examined in all three regions appeared normal.

Jan. 25th.

EXPERIMENT 10.—*Normal Condition*.—Mongrel; female, æt. two years; weight twenty-two pounds; temperature 101.2; pupils natural.

*Traumatized*.—Incomplete paraplegia.

Jan. 26th. Temperature 101.4, pupils normal.

“ 27th. “ 106.0, “ “

*Post-mortem*.—This examination revealed the following lesions: Both kidneys congested; ecchymoses in the connective tissue covering the anterior surface of the last lumbar and the upper sacral vertebrae. The brain and spinal cord apparently hyperæmic. The removal of

the integument over the sacral and lumbar regions showed an ecchymotic condition of the muscles. There had been a rupture of ligaments between the last lumbar and the upper sacral vertebræ. Weight of brain two ounces, one hundred and twenty grains. Weight of spinal cord three hundred and seventy-five grains.

*Microscopical Report.*—The report of this examination failed to reach the author.

Jan. 25th.

EXPERIMENT 11.—*Normal Condition.*—Mongrel; female, æt. two years and six months; weight seventeen pounds; temperature 102.0; pupils natural.

*Traumatized.*—Results apparently negative.

Jan. 26th. Temperature 105.5, pupils normal.

“ 27th. “ 101.6, “ “

“ 28th. “ 101.4, “ “

*Post-mortem.*—This examination revealed the following lesions: Both kidneys slightly congested; brain and cord apparently healthy. Weight of brain one ounce, three hundred and sixty grains. Weight of spinal cord two hundred and forty-three grains.

*Microscopical Report.*—The cord was large and had been bruised and cut in removing it. The vessels were everywhere distended with blood. There were no hemorrhages. The cord was quite soft and sections were not easily made.

Jan. 25th.

EXPERIMENT 12.—*Normal Condition.*—Mongrel; female, æt. one year; weight eight pounds; temperature 102.4; pupils natural.

*Traumatized.*—Animal walks with an unsteady gait; pupils moderately dilated.

Jan. 26th. Temperature 102.0, pupils appear somewhat dilated.

“ 27th. “ 102.2, “ “ “ “

*Post-mortem.*—This examination revealed the following lesions: A slight congestion of the meninges of the brain. Weight of brain one ounce, three hundred and eighty grains. Weight of cord one hundred and eighty-three grains.

*Microscopical Report.*—There was hyperæmia of the cord. The nerve fibres were much less distinctly seen in the anterior median columns than elsewhere, but the cut surfaces of all the sections seemed granular and the nerve ends less sharply defined than normal.

Jan. 25th.

EXPERIMENT 13.—*Normal Condition.*—Mongrel; female, æt. one year; weight seventeen pounds; temperature 103.1; pupils natural.

*Traumatized.*—Result was apparently negative.

Jan. 26th. Temperature 102.9, pupils normal.



Jan. 27th. Temperature 102.9, pupils normal.

" 28th. " 101.6, " "

" 31st. " 102.3, " "

*Post-mortem.*—This examination revealed the following lesions: A few hemorrhagic infarctions in the lungs; kidneys congested; meninges of the brain and spinal cord apparently healthy. Weight of brain two ounces and sixty-nine grains. Weight of cord two hundred and sixty-three grains.

*Microscopical Report.*—Material not received.

Feb. 1st.

EXPERIMENT 14.—*Normal Condition.*—Mongrel; male, æt. one year; weight sixteen pounds; temperature 101.5; pupils natural.

*Traumatized.*—No marked indications of injury.

Feb. 2d. Temperature 102.2, pupils normal.

*Post-mortem.*—This examination revealed the following lesions: Pleuritic adhesions on the right side, apparently some congestion of the meninges of the brain and spinal cord. Weight of brain two ounces and ninety grains. Weight of spinal cord two hundred and sixty-four grains.

*Microscopical Report.*—The cord appeared the same in all three regions examined. The vessels were over-distended with blood. Those of the gray matter (of the anterior horns) were especially so, and there was blood in the perivascular spaces. There was also blood, in places, in the meshes of the pia mater. No large hemorrhages were seen. The ganglion cells and nerve fibres appeared normal.

Feb. 1st.

EXPERIMENT 15.—*Normal Condition.*—Mongrel; male, æt. about two years; weight fifteen pounds; temperature 101.2; pupils natural.

*Traumatized.*—Result apparently negative.

Feb. 2d. Temperature 103.2, pupils normal.

" 3d. " 102.8, " "

" 4th. " 101.4, " "

*Post-mortem.*—This examination revealed the following lesions: Numerous hemorrhagic infarctions in the lungs, with some inflammatory action going on about them. The meninges of the brain and cord were apparently normal. Weight of brain two ounces, one hundred and fifty grains. Weight of spinal cord two hundred and sixty grains.

*Microscopical Report.*—None.

Feb. 1st.

EXPERIMENT 16.—*Normal Condition.*—Male, æt. about three years; weight fifteen pounds; temperature 102.0; pupils natural.

*Traumatized.*—Result apparently negative.

Feb. 2d. Temperature 102.2, pupils normal.

" 3d. " 102.0, " "

" 4th. " 104.1, " "

*Post-mortem.*—This examination revealed the following lesions: Meninges of the brain apparently very slightly congested, brain and spinal cord perfectly normal. Weight of brain two ounces and twenty-one grains. Weight of spinal cord two hundred and seventy-seven grains.

*Microscopical Report.*—None.

Feb. 1st.

EXPERIMENT 17.—*Normal Condition.*—Mongrel; male, æt. three years; weight forty-three pounds; temperature 103.2; pupils natural.

*Traumatized.*—This dog seemed very much disinclined to walk. Vomited after a few minutes and was restless.

Feb. 2d. Temperature 99.5, pupils normal.

" 3d. " 98.2, " "

*Observations.*—Walks with an awkward gait. There is partial paraplegia, with some loss of sensation in the hind legs.

*Post-mortem.*—This examination revealed the following lesions: Rupture of the bladder, abdominal cavity distended with urine, the organs contained within it all more or less inflamed, lungs contained numerous hemorrhagic infarctions and were considerably inflamed. Meninges of the brain were markedly congested, blood clot of considerable size beneath the dura mater, spinal cord seemed congested.

*Observations.*—This latter condition has not previously been seen in any case uncomplicated with a fracture of the column or injury to its ligaments.

*Microscopical Report.*—The brain is intensely hyperæmic; there is no lesion of the nerve cells or fibres. There are hemorrhages in the meshes of the fibrous tissue of the dura mater and upon its inner surface. The vessels in the cord are very greatly distended with blood, but there are no hemorrhages and no lesions that can be distinguished in the ordinarily stained sections.

Feb. 1st.

EXPERIMENT 18.—*Normal Condition.*—Mongrel; female, æt. two years; weight eleven pounds; temperature 104.3; pupils natural.

*Traumatized.*—The results are negative.

Feb. 2d.—Temperature 102.0, pupils normal.

*Post-mortem.*—This examination revealed the following lesions: A slight extravasation of blood into the areolar tissue within the pelvic cavity. The organs in the abdominal and thoracic cavities perfectly healthy; the brain and spinal cord apparently perfectly normal.



Weight of brain one ounce, four hundred and five grains. Weight of spinal cord three hundred and ninety-seven grains.

*Microscopical Report.*—Brain normal. Cord examined in cervical, dorsal and lumbar regions, and found normal.

Feb. 14th.

EXPERIMENT 19.—*Normal Condition.*—Mongrel; male, æt. three years; weight fifteen pounds; temperature 101.4; pupils natural.

*Traumatized.*—A negative result.

Feb. 16th. Temperature 102.9, pupils normal.

“ 17th. “ 102.8, “ “

“ 18th. “ 103.7, “ “

*Post-mortem.*—This examination revealed the following lesions: Several small hemorrhagic infarctions in the lungs, two superficial lacerations, about one-half an inch in length, in the liver, likewise hemorrhagic infarctions in the same organ, rupture of the left kidney, not involving its capsule, extravasation of blood, with the formation of a clot about the ruptured point, several points of hemorrhagic infarction in the cortical substance of this organ, while the right kidney was somewhat congested. Brain and spinal cord apparently healthy. Weight of brain two ounces. Weight of cord three hundred and five grains.

*Microscopical Report.*—Wanting.

Feb. 14th.

EXPERIMENT 20.—*Normal Condition.*—Mongrel; male, æt. one year; weight thirteen pounds; temperature 102.3; pupils natural.

*Traumatized.*—A negative result.

Feb. 16th. Temperature 103.1, pupils normal.

“ 17th. “ 102.2, “ “

*Post-mortem.*—This examination revealed the following lesions: Ecchymoses in one lobe of the liver. Brain and spinal cord appear perfectly healthy. Weight of brain two ounces, one hundred and forty-three grains. Weight of spinal cord two hundred and forty-nine grains.

*Microscopical Report.*—Spinal cord examined in all three regions, and found normal. Brain also normal. Other organs not received.

Feb. 14th.

EXPERIMENT 21.—*Normal Condition.*—Mongrel; female, æt. eighteen months; weight thirteen and one-half pounds; temperature 102.2; pupils natural.

*Traumatized.*—Negative results.

Feb. 16th. Temperature 102.9, pupils normal.

“ 17th. “ 103.9, “ “

“ 18th. “ 102.4, “ “

*Post-mortem.*—The result of this examination was entirely negative. No lesions were found. Weight of brain one ounce, four hundred and fifteen grains. Weight of spinal cord two hundred and fifty-five grains.

*Microscopical Report.*—Wanting.

Feb. 14th.

EXPERIMENT 22.—*Normal Condition.*—Mongrel; female, æt. one year; weight twelve pounds; temperature 102.2; pupils natural.

*Traumatized.*—The result was entirely negative.

Feb. 16th. Temperature 102.0, pupils normal.

“ 17th. “ 102.0, “ “

*Post-mortem.*—The only lesion revealed by this examination was a hemorrhagic infarction in the lobulus quadratus of the liver. Weight of brain two ounces. Weight of cord two hundred and ten grains.

*Microscopical Report.*—Wanting.

Feb. 14th.

EXPERIMENT 23.—*Normal Condition.*—Mongrel; male, æt. one year; weight seventeen pounds; temperature 102.5; pupils natural.

*Traumatized.*—Result negative.

Feb. 16th. Temperature 102.3, pupils normal.

“ 17th. “ 102.3, “ “

“ 18th. “ 102.2, “ “

“ 19th. “ 102.7, “ “

*Post-mortem.*—This examination entirely failed to reveal any lesion. Weight of brain one ounce, three hundred and ninety-five grains. Weight of cord three hundred and ninety-five grains.

*Microscopical Report.*—Wanting.

Feb. 14th.

EXPERIMENT 24.—*Normal Condition.*—Mongrel; male, æt. one year; weight twenty-eight and one-half pounds; temperature 101.2; pupils natural.

*Traumatized.*—Drags somewhat the hind legs.

Feb. 16th. Temperature 100.6, pupils normal.

“ 17th. “ 100.7, “ “

*Post-mortem.*—This examination revealed the following lesions: Both kidneys congested; bladder distended with urine; extensive ecchymoses in the lumbar and pelvic regions, involving both psoas muscles; brain perfectly normal; the spinal cord was hyperæmic downward from the lumbar enlargement, including a portion of the cauda equina; rupture of the ligaments between the last lumbar and first sacral vertebræ. Weight of brain two ounces and fifty grains. Weight of spinal cord three hundred and twenty-five grains.

*Microscopical Report.*—Brain was normal; cord was incised longi-

tudinally and was quite soft; sections could only be made from the upper part where it appeared normal.

Feb. 14th.

EXPERIMENT 25.—*Normal Condition*.—Mongrel; male, æt. two years; weight fifteen and one-half pounds; temperature 101.5; pupils natural.

*Traumatized*.—Negative results.

Feb. 16th. Temperature 102.8, pupils normal.

*Post-mortem*.—The result of this examination was wholly negative. Weight of brain one ounce, two hundred and sixty-three grains. Weight of spinal cord four hundred grains.

*Microscopical Report*.—The brain, cord and dura in this case were normal. The vascular supply normal.

Feb. 14th.

EXPERIMENT 26.—*Normal Condition*.—Mongrel; female, æt. one year; weight thirty pounds; temperature 103.2; pupils natural.

*Traumatized*.—Negative result.

Feb. 16th. Temperature 103.0, pupils normal.

" 17th. " 102.7, " "

" 18th. " 103.2, " "

*Post-mortem*.—This examination revealed the following lesions: Liver congested; commencing inflammation on the thinned edges; the surface of this organ presented a granular appearance; both kidneys congested; meninges of the brain slightly congested along the longitudinal sinus. Brain and spinal cord perfectly healthy. Weight of brain three ounces. Weight of cord four hundred and thirty-five grains.

*Microscopical Report*.—Wanting.

EXPERIMENT 27.—*Normal Condition*.—Mongrel; male, æt. one year; weight twenty-three and one-half pounds; temperature 100.4; pupils natural.

*Traumatized*.—Negative results.

Feb. 16th. Temperature 102.0, pupils normal.

" 17th. " 100.7, " "

" 18th. " 100.3, " "

" 19th. " 102.1, " "

*Post-mortem*.—This examination revealed the following lesions: Both kidneys moderately congested; meninges of brain and spinal cord apparently healthy. Weight of brain two ounces and eighty grains. Weight of spinal cord two hundred and seventy-nine grains.

*Microscopical Report*.—The brain and spinal cord were normal. The dura mater was normal.



Feb. 14th.

EXPERIMENT 28.—*Normal Condition*.—Mongrel; male, æt. two years; weight thirty-seven and one-half pounds; temperature 101.2; pupils natural.

*Traumatized*.—Result negative.

Feb. 16th. Temperature 101.5, pupils normal.

“ 17th. “ 101.6, “ “

“ 19th. “ 101.5, “ “

*Post-mortem*.—This examination revealed only a moderate congestion of the kidneys. The meninges of the brain and spinal cord are apparently healthy. Weight of brain two ounces and one hundred and eighty grains. Weight of spinal cord four hundred and sixty-two grains.

*Microscopical Report*.—Material too soft to cut.

Feb. 21st.

EXPERIMENT 29.—*Normal Condition*.—Mongrel; female, æt. four months; weight seventeen pounds; temperature 102.2; pupils natural.

*Traumatized*.—Negative result.

Feb. 22d. Temperature 102.4, pupils normal.

“ 23d. “ 102.8, “ “

*Post-mortem*.—This examination was entirely negative. Weight of brain two ounces, one hundred and fifty-one grains. Weight of spinal cord two hundred and sixty-eight grains.

*Microscopical Report*.—Wanting.

Feb. 21st.

EXPERIMENT 30.—*Normal Condition*.—Mongrel; female, æt. one year; weight sixteen and one-half pounds; temperature 102.2; pupils natural.

*Traumatized*.—Negative result.

Feb. 22d. Temperature 103.4, pupils normal.

“ 23d. “ 101.9, “ “

“ 24th. “ 102.0, “ “

“ 28th. “ 102.1, “ “

*Post-mortem*.—This examination was entirely negative. Weight of brain two ounces and sixty-five grains. Weight of spinal cord two hundred and eighty grains.

*Microscopical Report*.—Brain examined in two places, spinal cord in all three regions and found normal.

Feb. 21st.

EXPERIMENT 31.—*Normal Condition*.—Mongrel; female, æt. two years; weight fourteen pounds; temperature 102.8; pupils natural.

*Traumatized*.—Negative result.

Feb. 22d. Temperature 102.3, pupils normal.

“ 23d. “ 103.0, “ “



Feb. 24th. Temperature 103.5, pupils normal.

" 28th. " 103.5, " "

*Post-mortem.*—This examination revealed the following lesions: Lacerations of the spleen and liver. Weight of brain two ounces and forty-seven grains. Weight of spinal cord two hundred and twenty-three grains.

*Microscopical Report.*—Brain examined in several places and found normal. The cord was softened.

Feb. 21st.

EXPERIMENT 32.—*Normal Condition.*—Mongrel; male, æt. about nine months; weight twenty-one pounds; temperature 103.6; pupils natural.

*Traumatized.*—Negative results.

Feb. 22d. Temperature 102.7, pupils normal.

" 23d. " 102.1, " "

" 24th. " 101.2, " "

" 26th. " 101.2, " "

*Post-mortem.*—The only lesions revealed by this examination were hemorrhagic infarctions in the lungs, one of which was as large as a pea, others smaller. Weight of brain two ounces, two hundred and seventy-nine grains. Weight of spinal cord two hundred and forty-nine grains.

*Microscopical Report.*—Wanting.

Feb. 21st.

EXPERIMENT 33.—*Normal Condition.*—Mongrel; male, æt. one year; weight twenty-four pounds; temperature 102.1; pupils natural.

*Traumatized.*—Negative results.

Feb. 22d. Temperature 101.9, pupils normal.

" 23d. " 99.2, " "

" 24th. " 102.0, " "

March 5th. " 103.5, " "

*Post-mortem.*—This examination was entirely negative. Weight of brain two ounces, two hundred and ninety-three grains. Weight of cord two hundred and ninety-eight grains.

*Microscopical Report.*—All three regions of the brain and cord were in this case normal.

Feb. 21st.

EXPERIMENT 34.—*Normal Condition.*—Mongrel; female, æt. about two years; weight sixteen pounds; temperature 103.4; pupils natural.

*Traumatized.*—Negative result.

Feb. 22d. Temperature 102.2, pupils normal.

" 23d. " 103.0, " "

" 24th. " 102.0, " "

March 2d. Temperature 102.0, pupils normal.

*Post-mortem.*—This examination was entirely negative. Weight of brain two ounces, one hundred and one grains. Weight of spinal cord two hundred and seventy grains.

*Microscopical Report.*—The spinal cord examined in all three locations and found normal. The brain also normal.

Feb. 21st.

EXPERIMENT 35.—*Normal Condition.*—Mongrel; female, æt. about four months; weight eleven and one-half pounds; temperature 102.8; pupils natural.

*Traumatized.*—Negative result.

Feb. 22d. Temperature 102.9, pupils normal.

" 23d. " 101.7, " "

" 24th. " 100.2, " "

" 28th. " 102.7, " "

*Post-mortem.*—This examination revealed no lesion. Weight of brain one ounce, three hundred and thirty-three grains. Weight of spinal cord one hundred and seventy-five grains.

*Microscopical Report.*—The brain, dura and all three regions of the cord were examined and found normal.

Feb. 21st.

EXPERIMENT 36.—*Normal Condition.*—Mongrel; male, æt. two years; weight sixteen and one-half pounds; temperature 101.9; pupils natural.

*Traumatized.*—The result appeared to be negative.

(a) Feb. 22d. Temperature 101.7, pupils normal.

(b) " 23d. " 103.5, " "

(a) *Observations.*—This animal has been having convulsions during the last twenty-four hours, which seemed to be epileptic. Temperature 102.8.

(b) *Observations.*—Pupils cannot be examined; there is marked photophobia. This animal has remained in convulsions during the most of the day, the legs being flexed on the thighs at all times, and there were always convulsive movements.

*Post-mortem.*—This examination revealed the following lesions: Marked congestion of both kidneys; meninges of the brain congested along the line of the longitudinal fissure; congestion of the medulla; there was observed increased mobility of the spine in the dorsal region, and congestion of the connective tissue in the spinal canal from the dorsal region downward. Weight of brain two ounces and thirty grains. Weight of spinal cord two hundred and nineteen grains.

*Microscopical Report.*—There was congestion of the gray matter of the cord, and in several places, in both dorsal and lumbar regions, small punctate hemorrhages. The brain was normal.



Feb. 21st.

EXPERIMENT 37.—*Normal Condition*.—Mongrel; female, æt. two years; weight eleven pounds; temperature 101.7; pupils natural.

*Traumatized*.—Negative result.

Feb. 22d. Temperature 100.9, pupils normal.

“ 23d. “ 101.3, “ “

“ 24th. “ 102.3, “ “

March 1st. “ 101.0, “ “

*Post-mortem*.—This examination revealed no lesion. Weight of brain one ounce, three hundred and forty-five grains. Weight of spinal cord two hundred and fourteen grains.

*Microscopical Report*.—The brain in several places and the spinal cord in all three regions were examined and found normal.

Feb. 21st.

EXPERIMENT 38.—*Normal Condition*.—Mongrel; male, æt. two years; weight forty-nine and one-half pounds; temperature 102.9; pupils natural.

*Traumatized*.—Negative result.

Feb. 22d. Temperature 101.8, pupils normal.

“ 23d. “ 102.4, “ “

“ 24th. “ 102.6, “ “

“ 26th. “ 101.2, “ “

*Post-mortem*.—This examination revealed no other lesion than cystic degeneration of the kidneys in the first stage of this disease. Weight of brain two ounces, one hundred and sixty-one grains. Weight of cord three hundred and eighty-five grains.

*Microscopical Report*.—The brain and spinal cord were normal. There was found in the falx a small nodule of cartilage, one-sixteenth of an inch in diameter. In the human subject the falx often contains a small fragment of bone. This is probably the origin of that condition.

Feb. 21st.

EXPERIMENT 39.—*Normal Condition*.—Mongrel; male, æt. three years; weight twelve pounds; temperature 102.5; pupils natural.

*Traumatized*.—Negative result.

Feb. 22d. Temperature 102.8, pupils normal.

“ 23d. “ 102.5, “ “

“ 24th. “ 101.4, “ “

March 5th. “ 102.6, “ “

*Post-mortem*.—This examination revealed nothing abnormal. Weight of brain two ounces and forty grains. Weight of spinal cord two hundred and sixty-six grains.

*Microscopical Report*.—The brain and all three regions of the cord were normal.

Feb. 21st.

EXPERIMENT 40.—*Normal Condition*.—Mongrel; male, æt. one year; weight fifteen and three-fourths pounds; temperature 101.2; pupils natural.

*Traumatized*.—Pupils appeared somewhat dilated, but the result was otherwise entirely negative.

Feb. 23d. Temperature 101.9, pupils normal.

" 25th. " 102.3, " "

March 8th. " 103.5, " "

" 9th. " 104.1, " "

" 10th. " 102.9, " "

" 11th. " 102.2, " "

*Post-mortem*.—This examination was entirely negative. Weight of brain two ounces and seventy grains. Weight of spinal cord two hundred and thirty-two grains.

*Microscopical Report*.—The brain normal. Cord in all three regions normal.

Feb. 21st.

EXPERIMENT 41.—*Normal Condition*.—Mongrel; female, æt. two years; weight fifteen and three-fourths pounds; temperature 101.3; pupils natural.

*Traumatized*.—Gait unsteady. Walked with some difficulty. Pupils apparently dilated.

Feb. 22d. Temperature 101.3, pupils contracted.

" 23d. " 102.6, " about normal.

" 24th. " 100.2, " " "

*Post-mortem*.—This examination revealed the following lesions: Both kidneys slightly congested; deep ecchymoses of both psoas muscles; extensive subcutaneous ecchymoses over sacral and lumbar regions; partial separation of the last lumbar from the first sacral vertebra; meninges of the brain somewhat congested along the longitudinal sinus; spinal cord slightly congested in the lumbar region and downward into the cauda equina.

*Microscopical Report*.—The material rotten.

Feb. 21st.

EXPERIMENT 42.—*Normal Condition*.—Mongrel; male, æt. two years; weight twenty-four pounds; temperature 101.5; pupils natural.

*Traumatized*.—Negative result.

Feb. 22d. Temperature 101.7, pupils normal.

" 23d. " 102.6, " "

" 26th. " 101.6, " "

" 28th. " 102.9, " "

*Post-mortem*.—This examination revealed only a single lesion, a



hemorrhagic infarction in the lung. Weight of brain two ounces, two hundred and thirty-one grains. Weight of spinal cord three hundred and ninety-five grains.

*Microscopical Report.*—Wanting.

Feb. 21st.

EXPERIMENT 43.—*Normal Condition.*—Mongrel bull; male, æt. two years; weight twenty-seven pounds; temperature 101.4; pupils natural.

*Traumatized.*—Negative results.

Feb. 22d. Temperature 102.1, pupils normal.

“ 23d. “ 102.5, “ “

“ 24th. “ 101.6, “ “

“ 28th. “ 101.8, “ “

*Post-mortem.*—This examination revealed immense hemorrhagic infarctions in the lungs, and a slight laceration of the liver. Weight of brain two ounces, three hundred and fifty-two grains. Weight of cord three hundred and seventy-eight grains.

*Microscopical Report.*—Brain and dura normal; cord, also, in all regions normal.

Feb. 21st.

EXPERIMENT 44.—*Normal Condition.*—Mongrel; female, æt. six months; weight eleven pounds; temperature 102.2; pupils natural.

*Traumatized.*—Result negative.

Feb. 22d. Temperature 104.2, pupils normal.

“ 23d. “ 102.0, “ “

“ 24th. “ 102.2, “ “

“ 28th. “ 102.6, “ “

*Post-mortem.*—This examination was completely negative. Weight of brain one ounce, two hundred and fifty-two grains. Weight of spinal cord two hundred and fifty-two grains.

*Microscopical Report.*—Wanting.

Feb. 22d.

EXPERIMENT 45.—*Normal Condition.*—Mongrel; female, æt. about four months; weight six and one-half pounds; temperature 101.6; pupils natural.

Feb. 23d. Temperature 101.2, pupils normal.

“ 24th. “ 101.6, “ “

“ 25th. “ 100.9, “ “

March 1st. “ 101.6, “ “

*Post-mortem.*—This examination revealed the following lesions: Hepatization of a portion of the middle lobe of the right lung, slight congestion of the meninges of the brain, while the brain and spinal cord appear perfectly healthy.

*Microscopical Report.*—All three regions of the cord and brain normal.

Feb. 22d.

EXPERIMENT 46.—*Normal Condition.*—Mongrel; female, æt. about eight months; weight seventeen and one-half pounds; temperature 101.7; pupils natural.

*Traumatized.*—Movements slightly changed.

Feb. 25th. Temperature 102.2, pupils normal.

March 3d. " 100.7, " "

*Post-mortem.*—This examination was entirely negative. Weight of brain one ounce, four hundred and twenty-four grains. Weight of spinal cord one hundred and ninety grains.

*Microscopical Report.*—No lesions could be determined in the brain, and its vascular supply was normal. The vessels of the cord were well distended with blood, especially in the medulla. There were no hemorrhages. The dura of both brain and cord were normal.

Feb. 22d.

EXPERIMENT 47.—*Normal Condition.*—Mongrel; female, æt. three years; weight fifteen pounds; temperature 101.1; pupils natural.

*Traumatized.*—Result negative.

Feb. 23d. Temperature 101.4, pupils normal.

" 24th. " 101.0, " "

" 25th. " 101.7, " "

" 28th. " 102.4, " "

*Post-mortem.*—This examination revealed a moderate congestion of the kidneys. Weight of brain two ounces and five grains. Weight of spinal cord two hundred and ten grains.

*Microscopical Report.*—Brain normal. Spinal cord in all three regions normal.

March 7th.

EXPERIMENT 48.—*Normal Condition.*—Mongrel; female, æt. three years; weight twenty pounds; temperature 102.4; pupils natural.

*Traumatized.*—Pupils widely dilated.

March 8th. Temperature 102.1, pupils normal.

" 9th. " 101.7, " "

" 10th. " 102.4, " "

" 16th. " 100.9, " "

*Post-mortem.*—This examination revealed some engorgement of the kidneys. Weight of brain two ounces and sixty-six grains. Weight of cord two hundred and eighty-six grains.

*Microscopical Report.*—Wanting.

Feb. 22d.

EXPERIMENT 49.—*Normal Condition.*—Black and tan; female,

æt. about two years; weight thirteen and one-half pounds; temperature 100.4; pupils natural.

*Traumatized.*—Negative result.

Feb. 22d. Temperature 101.7, pupils normal.

“ 24th. “ 101.2, “ “

“ 25th. “ 101.0, “ “

March 3d. “ 101.9, “ “

*Post-mortem.*—This examination was perfectly negative. Weight of brain one ounce and four hundred grains. Weight of spinal cord two hundred and ninety grains.

*Microscopical Report.*—The cord in all three regions was found normal. The brain was normal. The dura both of brain and cord normal.

Feb. 22d.

EXPERIMENT 50.—*Normal Condition.*—Mongrel; male, æt. about five months; weight seven and one-half pounds; temperature 101.8; pupils natural.

*Traumatized.*—Limps a little; unsteady in gait.

Feb. 23d. Temperature 101.2, pupils normal.

“ 24th. “ 101.1, “ “

“ 25th. “ 102.1, “ “

“ 28th. “ 100.0, “ “

*Post-mortem.*—This examination revealed only a subcutaneous ecchymosis over the lumbar region. Weight of brain one ounce and seventy-one grains. Weight of spinal cord one hundred and twenty-five grains.

*Microscopical Report.*—The cord in all three regions and also the brain were found normal.

Feb. 22d.

EXPERIMENT 51.—*Normal Condition.*—Mongrel; male, æt. about one year; weight thirteen pounds; temperature 103.3; pupils natural.

*Traumatized.*—Negative result.

Feb. 23d. Temperature 102.8, pupils normal.

“ 24th. “ 103.0, “ “

“ 25th. “ 104.4, “ “

March 2d. “ 104.6, “ “

*Post-mortem.*—This examination revealed no lesion of any sort. Weight of brain two ounces, eleven and one-half grains. Weight of spinal cord one hundred and ninety-two grains.

*Microscopical Report.*—The brain, normal; cord in all three regions was normal.

Feb. 22d.

EXPERIMENT 52.—*Normal Condition.*—Mongrel; male, æt. about eight months; weight sixteen pounds; temperature 101.6; pupils natural.

*Traumatized.*—Limps on left hind leg.

Feb. 23d. Temperature 102.7, pupils normal.

“ 24th. “ 102.0, “ “

“ 25th. “ 103.0, “ “

March 1st. “ 104.8, “ “

*Post-mortem.*—This examination was entirely negative. Weight of brain two ounces and seventy-eight grains. Weight of spinal cord two hundred and sixty-nine grains.

*Microscopical Report.*—The brain normal. The spinal cord in all three regions normal. The dura of the cord was found normal. The dura of the brain was not received.

Feb. 22d.

EXPERIMENT 53.—*Normal Condition.*—Mongrel; female, æt. about eighteen months; weight thirteen and one-half pounds; temperature 101.1; pupils natural.

*Traumatized.*—Gait unsteady.

Feb. 23d. Temperature 101.2, pupils normal.

“ 24th. “ 103.3, “ “

“ 25th. “ 102.6, “ “

March 3d. “ 101.8, “ “

*Post-mortem.*—This examination revealed only a moderate congestion of the kidneys. No other lesions. Weight of brain two ounces and nineteen grains. Weight of spinal cord two hundred and seventy-one grains.

*Microscopical Report.*—The spinal cord was examined in all three regions and found normal. The brain was normal.

Feb. 22d.

EXPERIMENT 54.—*Normal Condition.*—Mongrel-bull; male, æt. six years; weight forty-one pounds; temperature 101.0; pupils natural.

*Traumatized.*—Negative result.

Feb. 23d. Temperature 101.6, pupils normal.

“ 24th. “ 102.2, “ “

“ 25th. “ 102.2, “ “

*Post-mortem.*—This examination revealed no lesion of any sort. Weight of brain two ounces, three hundred and sixty grains. Weight of cord three hundred and forty-two grains.

*Microscopical Report.*—Careful sections made of the brain, and all three regions of the spinal cord revealed no lesion.

March 7th.

EXPERIMENT 55.—*Normal Condition.*—Mongrel; female, æt. five years; weight sixteen pounds; temperature 102.9; pupils natural.

*Traumatized.*—Negative result.

March 8th. Temperature 102.9, pupils normal.

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March 9th. Temperature 103.1, pupils normal.

" 10th. " 102.7, " "

" 11th. " 101.2, " "

*Post-mortem.*—This examination revealed the following lesions: Left kidney somewhat congested; the membranes of the brain along the longitudinal sinus were somewhat ecchymosed. Other organs perfectly healthy. Weight of brain two ounces, one hundred and nine grains. Weight of the spinal cord two hundred and seventy grains.

*Microscopical Report.*—The brain and cord appeared everywhere normal.

March 7th.

EXPERIMENT 56.—*Normal Condition.*—Mongrel; male, æt. five years; weight eleven and one-half pounds; temperature 102.0; pupils natural.

*Traumatized.*—Negative result.

March 8th. Temperature 101.6, pupils normal.

" 9th. " 102.6, " "

" 10th. " 102.2, " "

*Post-mortem.*—This examination was entirely negative. Weight of brain one ounce, four hundred and five grains. Weight of spinal cord two hundred and sixty grains.

*Microscopical Report.*—The brain was normal. The cord in all three regions was found normal.

March 7th.

EXPERIMENT 57.—*Normal Condition.*—Mongrel; female, æt. one year; weight twelve and one-half pounds; temperature 103.0; pupils natural.

*Traumatized.*—Negative result.

March 8th. Temperature 103.5; pupils normal.

*Post-mortem.*—This examination revealed the following lesions: The lungs were found extensively inflamed. This inflammation is believed to have been due to the impure atmosphere in which the dog had been living rather than to the traumatism. The other organs were all perfectly healthy. Weight of brain one ounce, three hundred and ninety-six grains. Weight of cord two hundred and sixty-nine grains.

*Microscopical Report.*—The brain and spinal cord were carefully examined and found perfectly normal.

March 7th.

EXPERIMENT 58.—*Normal Condition.*—Mongrel; male, æt. one year; weight twenty pounds; temperature 103.3; pupils natural.

*Traumatized.*—Negative result.

March 8th. Temperature 104.4, pupils normal.

" 9th. " 102.4, " "

" 10th. " 103.3, " "

" 12th. " 101.1, " "

*Post-mortem.*—This examination revealed a slight ecchymosis in the meninges of the brain on both sides of the longitudinal sinus. All the other parts of the body were apparently healthy. Weight of brain two ounces and one hundred grains. Weight of cord three hundred and five grains.

*Microscopical Report.*—The dura mater over the longitudinal sinus externally was covered with fibrin and blood along the course of the sinus. The pia of the brain was moderately congested. The cord in all three regions and also the brain was found normal.

March 7th.

EXPERIMENT 59.—*Normal Condition.*—Mongrel; female, æt. one year; weight forty-one pounds; temperature 101.3; pupils natural.

*Traumatized.*—Pupils widely dilated.

March 8th. Temperature 102.3, pupils normal.

" 9th. " 102.5, " "

" 10th. " 101.5, " "

" 12th. " 101.7, " "

*Post-mortem.*—This examination revealed several large hemorrhagic infarctions in the lungs, which were surrounded with indurated borders. There were likewise some pleuritic adhesions. Weight of brain two ounces, four hundred and twelve grains. Weight of spinal cord three hundred and three grains.

*Microscopical Report.*—The organs in this case were found to be soft and their examination impossible.

March 7th.

EXPERIMENT 60.—*Normal Condition.*—Terrier; female, æt. one year; weight fifteen and one-half pounds; temperature 101.7; pupils natural.

*Traumatized.*—Some blood came from the mouth of this animal.

March 8th. Temperature 101.6, pupils normal.

" 9th. " 101.8, " "

" 10th. " 101.6, " "

" 11th. " 101.1, " "

*Post-mortem.*—This examination revealed no lesion of any sort. Weight of the brain two ounces and twenty grains. Weight of spinal cord two hundred and sixty-nine grains.

*Microscopical Report.*—The brain was examined in several places and found normal. The cord examined in all three regions and found normal.



March 7th.

EXPERIMENT 61.—*Normal Condition*.—Mongrel; female, æt. six years; weight twenty-six and one-half pounds; temperature 101.5; pupils natural.

*Traumatized*.—The result was apparently negative.

March 8th. Temperature 101.7, pupils normal.

“ 9th. “ 102.0, “ “

“ 10th. “ 101.1, “ “

“ 14th. “ 102.6, “ “

*Post-mortem*.—This examination was entirely negative. Weight of brain two ounces, two hundred and twenty-eight grains. Weight of cord three hundred and twenty-eight grains.

*Microscopical Report*.—The brain and spinal cord were carefully examined and appeared normal.

March 7th.

EXPERIMENT 62.—*Normal Condition*.—Mongrel; female, æt. four years; weight twenty-seven pounds; temperature 101.2; pupils natural.

*Traumatized*.—The result was apparently entirely negative.

March 8th. Temperature 102.0, pupils normal.

“ 9th. “ 101.7, “ “

“ 10th. “ 101.9, “ “

“ 14th. “ 101.3, “ “

*Post-mortem*.—This examination revealed no lesion of any sort. Weight of brain two ounces and seventy-five grains. Weight of spinal cord three hundred and sixty-three grains.

*Microscopical Report*.—The brain was examined in several places, and the spinal cord in all three locations, and both were found normal.

March 7th.

EXPERIMENT 63.—*Normal Condition*.—Mongrel; male, æt. two years; weight fourteen pounds; temperature 101.3; pupils natural.

*Traumatized*.—The result was apparently negative.

March 8th. Temperature 101.2, pupils normal.

“ 9th. “ 102.3, “ “

*Post-mortem*.—This examination revealed a large hemorrhagic infarction in one of the lobes of the left lung and a moderate congestion of both kidneys. Weight of brain two ounces, three hundred and ninety-five grains. Weight of cord three hundred and thirty-nine grains.

*Microscopical Report*.—The brain and spinal cord were examined in the usual way, and both were found normal.

March 7th.

EXPERIMENT 64.—*Normal Condition*.—Mongrel; male, æt. about ten months; weight twenty pounds; temperature 105.2; pupils natural.

*Traumatized.*—Death was the result.

*Post-mortem.*—This examination revealed the following lesions: Numerous hemorrhagic infarctions of the lungs, which were evidently inflamed at the time the traumatism was received, and likewise numerous very extensive and deep lacerations of the liver. The abdominal cavity was distended with extravasated blood. All other organs apparently healthy, except the spinal cord, which was apparently congested. Weight of brain three ounces. Weight of cord three hundred and forty-four grains.

*Microscopical Report.*—The vessels of the membranes of the cord were found to be everywhere distended with blood. In several places they were found to have been ruptured, and hemorrhages of small size had occurred in the surrounding tissue. This condition was present both in the dura and pia. The ganglion cells of the anterior horns seemed less distinctly defined than in the normal condition.

March 7th.

EXPERIMENT 65.—*Normal Condition.*—Mongrel; male, æt. about one year; weight twenty-nine pounds; temperature 101.1; pupils natural.

*Traumatized.*—Gait unsteady; fell once while attempting to walk.

March 8th. Temperature 102.6, pupils normal.

“ 9th. “ 102.0, “ “

“ 10th. “ 101.7, “ “

“ 12th. “ 101.3, “ “

*Post-mortem.*—This examination revealed only the following lesions: Several hemorrhagic infarctions in the lungs. Weight of brain two ounces, two hundred and thirty-eight grains. Weight of cord four hundred and thirty-six grains.

*Microscopical Report.*—The cord was only examined in two places. The dorsal region being so mutilated with the crushing incision made at the autopsy that no examination could be made. The cervical and lumbar regions are intensely congested, and numerous small hemorrhages are found, both in the gray and white substance of the cord. The brain is congested, but in all other respects appears normal.

March 7th.

EXPERIMENT 66.—*Normal Condition.*—Mongrel; female, æt. one year; weight nine pounds; temperature 100.9; pupils natural.

*Traumatized.*—Showed no marked signs of injury.

March 8th. Temperature 101.1, pupils normal.

“ 9th. “ 102.6, “ “

“ 10th. “ 102.1, “ “

“ 14th. “ 102.4, “ “

*Post-mortem.*—This examination revealed a fracture of the sixth,



seventh and eighth ribs on the right side, midway between the medial line and the spinal column. There were also some ecchymoses on the interior of the chest wall about the seat of the fractures. Weight of brain one ounce, three hundred and forty-three grains. Weight of spinal cord one hundred and sixty-five grains.

*Microscopical Report.*—The brain and spinal cord were examined in the usual way and were found to be normal.

March 7th.

EXPERIMENT 67.—*Normal Condition.*—Mongrel; male, æt. three years; weight twenty-eight pounds; temperature 100.7; pupils natural.

*Traumatized.*—Pupils appear dilated. This animal cannot walk, drags himself over the floor of the laboratory without using his hind legs.

March 8th. Temperature 101.4, pupils normal.

“ 9th. “ 101.4, “ “

“ 10th. “ 101.9, “ “

“ 16th. “ 101.8, “ “

*Post-mortem.*—This examination revealed the following lesions: Congestion of the cauda equina in the neighborhood of the junction of the last lumbar and the first sacral vertebræ; there was also some hemorrhage into the connective tissue about this point, the ligaments binding together this articulation were ruptured. Weight of brain two ounces, three hundred and thirteen grains. Weight of cord four hundred and thirteen grains.

*Microscopical Report.*—Wanting.

March 7th.

EXPERIMENT 68.—*Normal Condition.*—Mongrel; female, æt. six months; weight thirteen pounds; temperature 101.8; pupils natural.

*Traumatized.*—The result was apparently negative.

March 8th. Temperature 101.9, pupils normal.

“ 9th. “ 102.3, “ “

“ 10th. “ 102.8, “ “

“ 14th. “ 102.0, “ “

*Post-mortem.*—This examination was entirely negative. Weight of brain two ounces, one hundred and nine grains. Weight of spinal cord two hundred and fifty-three grains.

*Microscopical Report.*—The brain was examined in the vertex and also at the base and found normal. The cord was examined in all three regions and found normal.

March 7th.

EXPERIMENT 69.—*Normal Condition.*—Mongrel; female, æt. one year; weight fifteen and one-half pounds; temperature 100.7; pupils natural.

*Traumatized.*—Negative result.

March 8th. Temperature 100.7, pupils normal.

“ 9th. “ 102.7, “ “

“ 10th. “ 101.1, “ “

*Post-mortem.*—This examination was negative. Weight of brain two ounces and eighty-six grains. Weight of spinal cord two hundred and ninety-eight grains.

*Microscopical Report.*—The brain was found normal. All three regions of the spinal cord were found normal.

March 7th.

EXPERIMENT 70.—*Normal Condition.*—Mongrel; female, æt. one year; weight eleven and one-half pounds; temperature 102.0; pupils natural.

*Traumatized.*—The result was apparently negative.

March 8th. Temperature 102.8, pupils normal.

“ 9th. “ 102.1, “ “

*Post-mortem.*—This examination revealed the following lesions: The existence of pneumonia in the left lung; and there was also apparently some congestion of the meninges of the brain and spinal cord. Weight of brain one ounce, four hundred and thirty-two grains. Weight of spinal cord two hundred and forty-three grains.

*Microscopical Report.*—The vessels were everywhere distended with blood; the surfaces of all sections examined were granular. Nowhere were the nerve ends sharply defined, nor could the axis cylinder be made out. There were no accumulations of small round cells.

March 17th.

EXPERIMENT 71.—*Normal Condition.*—Mongrel; male, æt. about six months; weight twenty-four pounds; temperature 103.2; pupils natural.

*Traumatized.*—The result was apparently negative.

March 18th. Temperature 104.0, pupils normal.

“ 19th. “ 103.5, “ “

“ 21st. “ 103.2, “ “

“ 22d. “ 103.9, “ “

*Post-mortem.*—This examination revealed the following lesions: Congestion of the dura along the line of the longitudinal sinus, some blood effused between the skull and the membrane, but the brain and spinal cord appeared perfectly normal. Weight of brain one ounce, three hundred and ninety grains. Weight of spinal cord three hundred and forty-one grains.

*Microscopical Report.*—Sections from different parts of the brain and all three regions of the cord revealed no lesion.



March 17th.

EXPERIMENT 72.—*Normal Condition*.—Mongrel; male, æt. three months; weight six pounds; temperature 102.6; pupils natural.

*Traumatized*.—The result was apparently negative.

March 18th. Temperature 103.8, pupils normal.

“ 19th. “ 103.8, “ “

“ 21st. “ 102.9, “ “

*Post-mortem*.—This examination revealed only a slight congestion of the lungs, which may have been due to the mode of death. The other organs were perfectly normal. Weight of brain one ounce, four hundred and eight grains. Weight of spinal cord three hundred and fifty-four grains.

*Microscopical Report*.—The brain in several places and all three regions of the spinal cord were found normal.

March 17th.

EXPERIMENT 73.—*Normal Condition*.—Mongrel; male, æt. eighteen months; weight fifteen pounds; temperature 101.7; pupils natural.

*Traumatized*.—The result was apparently negative.

March 18th. Temperature 101.8, pupils normal.

“ 19th. “ 101.9, “ “

“ 21st. “ 101.9, “ “

*Post-mortem*.—This examination revealed only a single lesion, congestion of the right kidney, while all the other organs were apparently healthy. Weight of brain one ounce, three hundred and seventy-two grains. Weight of spinal cord two hundred and sixty-four grains.

*Microscopical Report*.—The brain and all three regions of the cord were examined and found normal.

March 17th.

EXPERIMENT 74.—*Normal Condition*.—Mongrel; male, æt. four months; weight five pounds; temperature 103.3; pupils natural.

*Traumatized*.—The result was apparently negative.

March 18th. Temperature 102.6, pupils normal.

“ 19th. “ 102.8, “ “

“ 21st. “ 102.8, “ “

“ 22d. “ 103.8, “ “

*Post-mortem*.—This examination revealed the following lesions: Hemorrhagic infarctions in the lungs, one lobe of the same in a complete state of pneumonic consolidation; congestion of the dura along the line of the longitudinal sinus; some extravasation of blood between the skull and this membrane at this point, while the brain and other organs seemed perfectly healthy. Weight of brain one ounce, two



hundred and forty-nine grains. Weight of cord two hundred and fifty-seven grains.

*Microscopical Report.*—The brain and cord were found normal.

March 17th.

EXPERIMENT 75.—*Normal Condition.*—Mongrel; male, æt. four years; weight seventeen pounds; temperature 100.9; pupils natural.

*Traumatized.*—The result was apparently negative.

March 18th. Temperature 101.2, pupils normal.

“ 19th. “ 101.3, “ “

“ 21st. “ 101.7, “ “

“ 22d. “ 102.8, “ “

*Post-mortem.*—This examination revealed no lesion. All the organs of the body were apparently perfectly healthy. Weight of brain two ounces, one hundred and nine grains. Weight of spinal cord three hundred and forty grains.

*Microscopical Report.*—The brain was examined in several places, and the spinal cord in all three regions, and found normal.

March 17th.

EXPERIMENT 76.—*Normal Condition.*—Mongrel; male, æt. one year; weight fourteen pounds; temperature 102.6; pupils natural.

*Traumatized.*—Killed by the fall.

*Post-mortem.*—This examination revealed the following lesions: Extensive laceration of the liver, extensive rupture of the ligament between the fifth and sixth cervical vertebræ, extravasation of blood at this point between the bony wall of the column and the dura of the cord. Weight of brain three ounces and fifty-one grains. Weight of spinal cord two hundred and thirty-nine grains.

*Microscopical Report.*—The brain and spinal cord in all three regions revealed no lesion.

March 17th.

EXPERIMENT 77.—*Normal Condition.*—Mongrel; female, æt. two years; weight twenty and one-half pounds; temperature 103.1; pupils natural.

*Traumatized.*—Negative result.

March 18th. Temperature 103.2, pupils normal.

“ 19th. “ 102.6, “ “

“ 21st. “ 102.9, “ “

*Post-mortem.*—This examination revealed the following lesions: Numerous hemorrhagic infarctions of the lungs, which were surrounded by an unusual amount of congestion, several large and deep lacerations in the liver. There was also in the abdominal cavity about two ounces of coagulated blood. Weight of brain two ounces, two hundred and

sixty-nine grains. Weight of cord two hundred and twenty-nine grains.

*Microscopical Report.*—The brain and all three regions of the cord were normal.

March 17th.

EXPERIMENT 78.—*Normal Condition.*—Mongrel; male, æt. one year; weight two pounds; temperature 102.8; pupils natural.

*Traumatized.*—The result was apparently negative.

March 18th. Temperature 102.4, pupils normal.

“ 19th. “ 102.0, “ “

*Post-mortem.*—This examination revealed the following lesions: Moderate congestion of both kidneys, a small blood clot between the bony wall and the dura over the anterior portion of the medulla, laceration of ligaments between the last lumbar and first sacral vertebræ, blood clots upon the cauda equina at this point. Weight of brain two ounces and ninety grains. Weight of spinal cord two hundred and sixty-nine grains.

*Microscopical Report.*—The gray matter of the cord seemed slightly congested. The brain was normal.

March 17th.

EXPERIMENT 79.—*Normal Condition.*—Mongrel; female, æt. five years; weight twenty-one pounds; temperature 102.3; pupils natural.

*Traumatized.*—Result negative.

March 18th. Temperature 102.7, pupils normal.

“ 19th. “ 101.9, “ “

*Post-mortem.*—This examination failed to reveal any lesion. Weight of brain two ounces, one hundred and forty grains. Weight of cord three hundred and twenty-eight grains.

*Microscopical Report.*—The brain in several places has been examined and all three regions of the cord found normal.

March 17th.

EXPERIMENT 80.—*Normal Condition.*—Mongrel; male, æt. one year; weight sixteen and one-half pounds; temperature 101.7; pupils natural.

*Traumatized.*—Negative result.

March 18th. Temperature 101.7, pupils normal.

*Post-mortem.*—This examination revealed the following lesions: The lungs were completely studded with hemorrhagic infarctions, some of which were larger than a large pea, while others were about the size of a pin's head. Some portions of the lungs were extensively congested. There was also found a slight laceration of the liver. Weight of brain two ounces, two hundred and forty-nine grains. Weight of cord two hundred and nineteen grains.

*Microscopical Report.*—The brain and all three regions of the cord were normal.

March 24th.

EXPERIMENT 81.—*Normal Condition.*—Mongrel; female, æt. three years; weight twenty-four pounds; temperature 103.3; pupils natural.

*Traumatized.*—The result was apparently negative.

March 25th. Temperature 102.3, pupils normal.

“ 26th. “ 102.3, “ “

“ 28th. “ 102.3, “ “

“ 29th. “ 102.0, “ “

*Post-mortem.*—This examination revealed the following lesions: Two hemorrhagic infarctions in the left lung, a slight laceration of the liver, engorgement of both kidneys, and it was observed that the small veins on the posterior surface of the spinal cord were unusually prominent. Weight of brain three ounces and forty grains. Weight of spinal cord three hundred and sixty grains.

*Microscopical Report.*—The vessels of both the brain and the spinal cord were moderately distended with blood. The brain, cord and dura mater were found normal.

March 28th.

EXPERIMENT 82.—*Normal Condition.*—Mongrel; male, æt. one year; weight thirteen pounds; temperature 102.8; pupils natural.

*Traumatized.*—The result seemed negative.

March 25th. Temperature 100.7, pupils normal.

“ 26th. “ 100.6, “ “

“ 28th. “ 101.1, “ “

*Post-mortem.*—This examination failed to reveal any lesion. Weight of brain two ounces and thirty-five grains. Weight of spinal cord two hundred and sixty grains.

*Microscopical Report.*—The brain was normal. The spinal cord in all three locations was also found normal.

March 24th.

EXPERIMENT 83.—*Normal Condition.*—Mongrel; male, æt. three years; weight twenty-three pounds; temperature 103.5; pupils natural.

*Traumatized.*—The result was apparently negative.

March 25th. Temperature 103.1, pupils normal.

“ 26th. “ 104.8, “ “

“ 28th. “ 102.9, “ “

“ 29th. “ 102.8, “ “

*Post-mortem.*—This examination revealed the following lesions: Several large hemorrhagic infarctions were found in the lungs; engorgement of both kidneys; all other organs were normal. Weight of brain



two ounces and thirty-four grains. Weight of cord three hundred and six grains.

*Microscopical Report.*—The dura, brain and all three regions of the cord were examined and found normal. The contents of the bottle labeled lungs and No. 83 were rotten.

March 24th.

EXPERIMENT 84.—*Normal Condition.*—Mongrel; male, æt. three years; weight thirty-four pounds; temperature 102.4; pupils natural.

*Traumatized.*—Paraplegia.

March 25th. Temperature 101.1, pupils normal.

*Post-mortem.*—This examination revealed the following lesions: Large hemorrhagic infarctions in the right lung; slight laceration of the liver; engorgement of both kidneys; extravasation of blood behind the peritoneum in the pelvic cavity which extended upwards even to the kidneys; rupture of ligaments between the last lumbar and first sacral vertebræ; congestion of the cauda equina, which extended upwards to the spinal cord and its membranes; the cellular tissue surrounding the cord was infiltrated with blood. Weight of brain two ounces, three hundred and two grains. Weight of spinal cord four hundred and forty grains.

*Microscopical Report.*—The brain of this dog was very hyperæmic. The pia of the cord was in the same condition. Sections made in all three regions of the spinal cord showed hyperæmia, especially in the gray matter of the cord, and most marked in the anterior horns.

March 24th.

EXPERIMENT 85.—*Normal Condition.*—Mongrel; female, æt. nine months; weight eleven pounds; temperature 102.5; pupils natural.

*Traumatized.*—Partial paraplegia.

March 25th. Temperature 103.0, pupils normal.

“ 26th. “ 103.5, “ “

*Post-mortem.*—This examination revealed the following lesions: Moderate congestion of both kidneys; congestion of the cauda equina, which was evidently connected with a fracture found in the sacrum. Weight of brain two ounces. Weight of spinal cord two hundred and five grains.

*Microscopical Report.*—The cord in dorsal and lumbar regions was congested. There was found a hemorrhage into the central canal in the lumbar region. Brain was found to be normal.

March 24th.

EXPERIMENT 86.—*Normal Condition.*—Mongrel bull; female, æt. one year; weight twenty pounds; temperature 102.4; pupils natural.

*Traumatized.*—The result was essentially negative.

March 25th. Temperature 102.2, pupils normal.

March 26th. Temperature 102.2, pupils normal.

" 28th. " 101.6, " "

" 29th. " 102.3, " "

*Post-mortem.*—This examination revealed the following lesions: A hemorrhagic infarction was found in the middle lobe of the right lung, which was surrounded with a patch of consolidation about one inch in diameter, and there was likewise a marked congestion of the left kidney. Weight of brain two ounces, one hundred and nine grains. Weight of spinal cord two hundred and seventy-six grains.

*Microscopical Report.*—The brain and spinal cord were examined in the usual way and found normal.

March 24th.

EXPERIMENT 87.—*Normal Condition.*—Mongrel; male, æt. about five years; weight thirty pounds; temperature 102.0; pupils natural.

*Traumatized.*—The result was apparently negative.

March 25th. Temperature 101.7, pupils normal.

" 26th. " 102.2, " "

" 28th. " 101.6, " "

" 29th. " 102.3, " "

*Post-mortem.*—This examination revealed the following lesions: Both kidneys were markedly congested, all the other organs were apparently healthy. Weight of brain two ounces, two hundred and forty-eight grains. Weight of spinal cord three hundred and seventy-seven grains.

*Microscopical Report.*—Numerous sections from different locations of the brain revealed no lesion. The cord in all three regions was found normal. The dura was normal.

March 24th.

EXPERIMENT 88.—*Normal Condition.*—Mongrel; female, æt. one year; weight sixteen pounds; temperature 102.9; pupils natural.

*Traumatized.*—The result was apparently negative.

March 25th. Temperature 102.8, pupils normal.

" 26th. " 102.5, " "

*Post-mortem.*—This examination revealed the following lesion: Several large hemorrhagic infarctions were found in the lungs, surrounded by inflammatory rings of congestion. Weight of brain two ounces, one hundred and thirty grains. Weight of cord two hundred and eighty-four grains.

*Microscopical Report.*—Brain and all three regions of the cord were normal.

March 24th.

EXPERIMENT 89.—*Normal Condition.*—Mongrel; male, æt. two years; weight twenty-four pounds; temperature 102.8; pupils natural.



*Traumatized.*—There was apparently some paraplegia.

March 25th. Temperature 102.1, pupils normal.

“ 26th. “ 102.2, “ “

“ 28th. “ 102.9, “ “

“ 29th. “ 102.1, “ “

*Post-mortem.*—This examination revealed the following lesions: Several hemorrhagic infarctions surrounded by consolidated rings; marked engorgement of both kidneys; ecchymosis of the left psoas muscles; rupture of the posterior ligaments connecting the last lumbar and the first sacral vertebra; infiltration into the areolar tissue about the cauda equina at this point, with apparently some congestion of the nerves. Weight of brain two ounces, two hundred and seventy grains. Weight of spinal cord three hundred and twenty-six grains.

*Microscopical Report.*—The cells and nerve fibres appeared normal. The dura mater normal. The vessels of the brain and spinal cord were everywhere distended with blood. The greatest degree of hyperæmia being in the lumbar region.

March 24th.

EXPERIMENT 90.—*Normal Condition.*—Mongrel; male, æt. five years; weight twenty-five pounds; temperature 103.0; pupils natural.

*Traumatized.*—Negative result.

March 25th. Temperature 103.2, pupils normal.

“ 26th. “ 103.1, “ “

“ 28th. “ 102.2, “ “

*Post-mortem.*—This examination was completely negative. Every organ in the animal was apparently healthy. Weight of brain two ounces, two hundred and eighteen grains. Weight of spinal cord three hundred and twenty-seven grains.

*Microscopical Report.*—The brain was examined in several locations and showed no lesion. All three regions of the cord were found normal. The dura of both the brain and the cord was normal.

March 24th.

EXPERIMENT 91.—*Normal Condition.*—Mongrel; male, æt. one year; weight fourteen pounds; temperature 102.9; pupils natural.

*Traumatized.*—Negative result.

March 25th. Temperature 103.2, pupils normal.

“ 26th. “ 102.4, “ “

*Post-mortem.*—This examination revealed the following lesions: A large hemorrhagic infarction in the right lung; extensive laceration of the liver, with an infiltration of blood into the peritoneal cavity. Weight of brain two ounces, one hundred and eighty grains. Weight of spinal cord two hundred and eighty grains.

*Microscopical Report.*—Sections of several parts of the brain and of all



three regions of the spinal cord were examined and all were found normal. The dura mater was normal.

March 31st.

EXPERIMENT 92.—*Normal Condition*.—Mongrel; female, æt. two years; weight nine pounds; temperature 102.4; pupils natural.

*Traumatized*.—Movements unsteady. Pupils dilated.

April 1st. Temperature 101.4, pupils normal.

“ 2d. “ 101.5, “ “

“ 3d. “ 102.1, “ “

“ 7th. “ 101.5, “ “

*Post-mortem*.—This examination was entirely negative. No lesions recognized. Weight of brain one ounce, two hundred and ninety-two grains. Weight of cord one hundred and sixteen grains.

*Microscopical Report*.—There was congestion of the pia, otherwise the brain was normal. The vessels of the gray matter of all three regions of the cord were distended, otherwise the cord was normal.

March 31st.

EXPERIMENT 93.—*Normal Condition*.—Mongrel; male, æt. about two years; weight thirteen pounds; temperature 103.8; pupils natural.

*Traumatized*.—Gait unsteady; seemed weak in the hind legs.

April 1st. Temperature 103.6, pupils normal.

“ 2d. “ 103.4, “ “

“ 3d. “ 102.1, “ “

“ 4th. “ 103.8, “ “

*Post-mortem*.—This examination revealed the following lesions: A rupture of the ligaments between the last lumbar and the first sacral vertebræ. Weight of brain two ounces and six grains. Weight of cord two hundred and twenty grains.

*Microscopical Report*.—The brain and its membranes were congested; the cord was congested in all three regions. There were hemorrhages in the lumbar region, both in the gray and white matter.

March 31st.

EXPERIMENT 94.—*Normal Condition*.—Mongrel; female, æt. one year; weight twenty-five pounds; temperature 103.4; pupils natural.

*Traumatized*.—The result was entirely negative.

April 1st. Temperature 102.8, pupils normal.

“ 2d. “ 102.2, “ “

“ 3d. “ 102.4, “ “

“ 7th. “ 102.4, “ “

*Post-mortem*.—This examination failed to reveal any lesion. Weight of brain two ounces, three hundred and eight grains. Weight of spinal cord three hundred and sixteen grains.

*Microscopical Report*.—The brain was examined in several places and

found normal. The cord was examined in all three regions and found normal.

March 31st.

EXPERIMENT 95.—*Normal Condition*.—Mongrel; male, æt. eighteen months; weight fifteen pounds; temperature 104.1; pupils natural.

*Traumatized*.—The result was entirely negative.

April 1st. Temperature 103.5, pupils normal.

“ 2d. “ 103.5, “ “

“ 3d. “ 102.5, “ “

“ 4th. “ 103.0, “ “

*Post-mortem*.—This examination revealed no lesions. All the organs were found normal. Weight of brain two ounces and sixty grains. Weight of spinal cord two hundred and fifty-two grains.

*Microscopical Report*.—The dura mater was normal; the longitudinal sinus empty. The examination of several sections from the brain and likewise from all three regions of the cord revealed nothing abnormal.

March 31st.

EXPERIMENT 96.—*Normal Condition*.—Terrier; female, æt. one year; weight eight pounds; temperature 103.2; pupils natural.

*Traumatized*.—The result was negative.

April 1st. Temperature 102.8, pupils normal.

“ 2d. “ 102.8, “ “

“ 3d. “ 102.8, “ “

“ 4th. “ 103.0, “ “

*Post-mortem*.—This examination revealed a single hemorrhagic infarction in the left lung. Weight of brain one ounce, three hundred and forty grains. Weight of spinal cord one hundred and eighty grains.

*Microscopical Report*.—The brain, cord and meninges were examined in the usual way, and no abnormality was detected.

March 31st.

EXPERIMENT 97.—*Normal Condition*.—Terrier; male, æt. two years; weight fifteen pounds; temperature 102.8; pupils natural.

*Traumatized*.—Walks with some difficulty.

April 1st. Temperature 102.2, pupils normal.

*Observations*.—Pupils slightly dilated. This animal was seriously injured; moves about but little, and makes no attempt to free himself from the sawdust.

April 2d. Temperature 102.4, pupils slightly dilated.

“ 3d. “ 102.8, “ normal.

*Observations*.—This animal seemed somewhat improved.

April 7th. Temperature 102.5, pupils normal.



*Post-mortem.*—This examination revealed the following lesions: Rupture of ligaments between the last lumbar and first sacral vertebrae, congestion of the lower portion of the spinal cord, marked engorgement of both kidneys. Weight of brain two ounces and forty-four grains. Weight of spinal cord two hundred and twenty-one grains.

*Microscopical Report.*—The brain, spinal cord and one kidney rotten. March 31st.

EXPERIMENT 98.—*Normal Condition.*—Mongrel; male, æt. nine months; weight twenty-one pounds; temperature 102.8; pupils natural.

*Traumatized.*—The result was apparently negative.

April 1st. Temperature 103.6, pupils seem rather small.

“ 2d. “ 103.5, pupils normal.

*Post-mortem.*—This examination revealed the following lesions: Two hemorrhagic infarctions in the lower lobe of the left lung, some congestion of the meninges of the brain along the great longitudinal sinus. Weight of brain two ounces, two hundred and eight grains. Weight of spinal cord three hundred and one grains.

*Microscopical Report.*—Sections of the brain from the vertex and the base were examined, and the vessels of both the pia and the gray matter were congested. The cord was examined in all three sections, and there was found but slight hyperæmia.

March 31st.

EXPERIMENT 99.—*Normal Condition.*—Mongrel; female, æt. one year; weight nine and one-half pounds; temperature 103.6; pupils natural.

*Traumatized.*—The result was apparently negative.

April 1st. Temperature 102.8, pupils apparently dilated.

“ 2d. “ 102.5, pupils normal.

“ 3d. “ 101.9, “ “

“ 11th. “ 102.6, “ “

*Post-mortem.*—This examination revealed the following lesion: Congestion of both kidneys. All the other organs were apparently healthy. Weight of brain one ounce, four hundred and twenty grains. Weight of spinal cord one hundred and eighty-six grains.

*Microscopical Report.*—The brain and cord were normal. The pia mater was normal. There was no lesion of the dura mater of either the brain or cord.

March 31st.

EXPERIMENT 100.—*Normal Condition.*—Mongrel; female, æt. two years; weight ten and one-half pounds; temperature 102.7; pupils natural.



*Observation.*—This dog was constantly coughing, eyes dull, etc.

*Traumatized.*—The result was apparently negative.

April 1st. Temperature 102.4, pupils normal.

“ 2d. “ 103.0, “ “

*Post-mortem.*—This examination revealed the following lesions: Hemorrhagic infarctions and a diffuse inflammation of the lungs. The meninges of the left hemisphere of the brain were found congested. Weight of brain two ounces and sixty-six grains. Weight of cord two hundred and fifty-five grains.

*Microscopical Report.*—The vessels of the brain and spinal cord were physiologically distended with blood; the brain and dura normal. All regions of the cord were normal.

We have now completed the record of one hundred and forty-one experiments. These experiments were made with the full determination of securing reliable results, and without regard to the amount of time required for the work, or other essential expenditures. The temperatures were taken with certified thermometers, and the records corrected by the certificates. The average normal temperature of First Series of forty-one dogs was 102.49, while the Second Series of one hundred dogs was 102.25; therefore the general average for both Series of one hundred and forty-one dogs was 102.32.

The record before us is too voluminous to be fully comprehended in its present form, and therefore it becomes necessary to classify our material, in order that we may study carefully each class with especial reference to the subject under consideration.

In the record of 127 experiments, the following data are respectively supplied—the weight of the dog, brain and spinal cord. The total of these weights are expressed in pounds and decimals as follows—dogs 2562.55, brains 18.41, spinal cords 5.10.

We determine from the above figures that the average weight of a dog was 20.17 pounds, the average of a brain was 2.32 ounces, while the average of a spinal cord was 282.1 grains. Consequently, the weight of the brain is about seven thousandths (.007) of the weight of the body in these animals, and the weight of the spinal cord is about twenty-eight per cent. of the weight of the brain.

The traumatisms or injuries produced by these experiments were frequently compound and nearly always complicated, while in degree of severity they differed widely, being in some instances quickly fatal, while in other cases the injuries were so slight as to be imperceptible either in the post-mortem or microscopical examination. The cases in which death occurred quickly and was directly caused by the experiments in the First Series of cases were the following: Experiments 2,

17, 20, 22, 29 and 35, while those in the Second Series were Experiments 64 and 76. It will be here seen that the First Series of forty-one yielded six of these fatal cases, while the Second Series of one hundred afforded only two. Death was caused in Experiments 2, 17 and 20 by ruptures of the aorta. In Experiment 22, death was due chiefly to the deep lacerations in the lungs, injury of the liver, etc. In Experiment 29, death was caused by rupture of the cardiac ventricles. The cause of death in the 35th Experiment existed in the rupture of the right auricle and the left pulmonary artery. In the 64th Experiment the cause of death was in the lacerations of the liver, which gave rise to a profuse hemorrhage, although there were hemorrhagic infarctions in the lungs and a preëxisting pneumonia. The post-mortem examination in the 76th Experiment revealed, as the cause of death, extensive lacerations of the liver and a rupture of the ligaments between the fifth and sixth cervical vertebræ. The causes of death in Experiment 22 were complicated with intense hyperæmia of the brain and spinal cord, while in the 20th and 35th Experiments there were found small hemorrhages into the gray matter of the cord. The complication in the 64th Experiment consisted of distention of the vessels of the membranes of the spinal cord, which had ruptured in several places, and hemorrhages of small size had occurred in the surrounding tissue.

Let us now take a retrospective view of the fractures, some of which involved the vertebræ, while in one instance the ribs were the seat of injury.

The Experiments 3, 4 and 8 belonged to the First Series, while 2, 5, 66 and 85 were included in the Second Series. The post-mortem examinations made in the Experiments 3 and 4 showed there was in the former instance a comminuted fracture of the spinous process and body of the seventh dorsal vertebra, while in the 4th Experiment there was a simple fracture of the body of the last lumbar vertebra. Experiment 8 had resulted in a fracture of the right humerus.

The fractures in the Experiments 2, 5, 66 and 85, described in the order in which the figures are placed, are as follows: A simple fracture of the body of one of the upper lumbar vertebra; a comminuted fracture of the body of the last lumbar vertebra; fracture of the 6th, 7th and 8th ribs, on the right side, and likewise a fracture found in the sacrum, which caused congestion of the cauda equina, etc. In the 66th Experiment, Second Series, there was no complication of either the brain or spinal cord, and in this connection it should be remembered the injury consisted in a fracture of ribs; while in the Experiments 3, 4 and 8, of the First Series, 2, 5 and 85, of the Second Series, the complications are stated after the figures in brackets, which are the same as those employed to indicate the number of the Experi-



ment. (3) There was a break in the dorsal region of the spinal cord, above and below which the cord was softened and intensely hyperæmic. (4) Hyperæmia of the brain and spinal cord. This morbid condition was most marked in the lumbar region. (8) Brain and spinal cord normal. (2) Brain intensely hyperæmic, otherwise normal. The spinal cord was hyperæmic throughout. (5) The meninges of the brain and spinal cord were hyperæmic. (85) Brain normal. Congestion of the cord in the dorsal and lumbar regions. Hemorrhage into the central canal in the lumbar region. We have discovered by an examination of the manuscript before us, that incomplete rupture of the ligaments of the sacro-lumbar articulation occurred only eleven times, but in every instance this accident was complicated with pathological changes in some portion of the cerebro-spinal axis. It is thought that, inasmuch as these lesions differed from each other merely in degree, no further description is required. The author will, however, refer the reader to each of these experiments, in order that they may be carefully examined.

In the First Series there are two cases, numbers 5 and 7, while in the Second Series there are nine, 4, 10, 24, 67, 78, 84, 89, 93 and 97. The following are the complications to which allusions have been previously made in connection with these cases: (5) The entire cord was hyperæmic, etc. (7) The cord was hyperæmic; its cut surfaces looked granular, and the ends of the nerves were less distinctly seen. These conditions were especially marked in the lumbar region. (4) The vessels of the brain were hyperæmic. The cord was congested up to the middle of the dorsal region. (10) The brain and spinal cord appeared intensely hyperæmic. (24) The brain normal. The spinal cord hyperæmic from the lumbar enlargement downwards, including a portion of the cauda equina. (67) Congestion of the cauda equina about the lumbo-sacral articulation, with some hemorrhage into the connective tissue about this point. (78) Brain normal. The gray matter of the cord seemed slightly congested. (84) Brain very hyperæmic. The pia of the cord in the same condition. The spinal cord hyperæmic, especially the gray matter, etc. (89) The vessels of the brain and spinal cord were everywhere distended with blood, the greatest degree of hyperæmia being in the lumbar region. (93) The brain and its membranes were congested. The cord was congested in all three regions. There were hemorrhages in the lumbar region, both in the gray and white matter. (97) Congestion of the lower portion of the spinal cord. In addition to the cases in which a rupture of the spinal ligaments existed, there were also observed six cases in which there was increased mobility between the vertebræ. This increased mobility was unquestionably due to a stretching of the verte-



bral ligaments. Three of these cases occurred in the First Series, and three in the Second Series of Experiments. The record of the First Series may be examined by a reference to Experiments 9, 13 and 16; while the latter may be studied in 9, 36 and 41.

The relations of these cases to the cerebro-spinal axis are the following: (9) Brain and spinal cord normal. (13) Brain and spinal cord intensely congested. Punctate hemorrhages in the brain, likewise in the gray and white matter of the cord. (16) Brain normal. Spinal cord intensely hyperæmic. Extensive punctate hemorrhages in the lumbar and cervical regions, etc.; while in the latter Series they are: (9) Some congestion of the meninges of the brain and spinal cord. (36) Brain normal. Congestion of the gray matter of the cord, and a few punctate hemorrhages in the dorsal and lumbar regions. (41) Brain congested along the longitudinal sinus. Spinal cord slightly congested in lumbar region downward to the cauda equina.

We have now analyzed twenty-five experiments in which pathological changes were observed in the cerebro-spinal axis, as complications, and the numbers belonging to each class are as follows: Traumatisms quickly fatal, 4; fractures, 5; rupture of spinal ligaments, 11; stretching of spinal ligaments, causing increased mobility in vertebral articulations, 5. In addition to *these spinal* injuries, there are twenty-five other cases which occurred in connection with the one hundred and forty-one experiments. Seven of these belong to the First Series of Experiments, and eighteen to the Second Series. The numbers of these Experiments in the former Series are as follows: 1, 6, 10, 23, 25, 30 and 31, while in the latter Series they are: 1, 3, 6, 7, 8, 11, 12, 14, 16, 17, 26, 58, 65, 70, 71, 74, 92 and 98. Some of these cerebro-spinal injuries just enumerated are the principal or only traumatism recognized in the post-mortem or microscopical examinations. Thus, in the First Series, the cerebro-spinal injuries are the only morbid conditions recognized in Experiments 1 and 6; while in the Second Series, essentially the same comment is applicable in the following cases: 3, 6, 7, 8, 11, 12, 14, 16, 58, 71, 92 and 98.

It will be observed that both Series of Experiments yielded a total of fourteen cases in which the cerebro-spinal injuries are the principal or only traumatisms; and, it therefore follows, that there are eleven cases of the twenty-five which we are now considering classed as complications. These cases classed as complications may be examined by a reference to the Experiments in the First Series, numbered 10, 23, 25, 30 and 31, and in the Second Series by those designated by numbers 1, 17, 26, 65, 70 and 74. A further summary of the one hundred and forty-one Experiments, arranged and conducted with the especial desire to produce the greatest amount of injury to the cerebro-

spinal axis, consistent with the preservation of the life of the animal sufficiently long to enable us to make a study of these cases, resulted in the production of pathological changes in this center in fifty instances, thirty-six of which are classed as complications while fourteen are the chief lesions. The pathological changes observed in the cerebro-spinal axis are in some cases organic, while in others they are merely functional, but any attempt at an accurate and full classification of the same would involve us in the performance of an almost endless task.

It is likewise thought the references already given will enable those interested in this subject to follow out any line of inquiry pertaining to it with the expenditure of a comparatively small amount of time.

We have now reached a point where it is deemed highly important to enumerate the diseases and traumatisms recognized in the thoracic, abdominal and pelvic cavities during the study of our Experiments. The advantage of considering these morbid conditions connectively, becomes more apparent when the attention is directed to the relation of cause and effect, and the connection existing between the different injuries. The following classification and enumeration affords a general idea of some of the results of these Experiments:—

Hemorrhagic Infarctions of Lungs, . . . . .	36
Lacerations of Lungs, . . . . .	1
Rupture of Lungs, . . . . .	1
Pneumonia, . . . . .	4
Pneumonic Hepatization, . . . . .	5
Congestion of Lungs, . . . . .	3
Lacerations of Liver, . . . . .	15
Hemorrhagic Infarctions of Liver, . . . . .	4
Rupture of Liver, . . . . .	1
Congestion of Liver, . . . . .	1
Inflammation of Liver, . . . . .	1
Congestion of Kidneys, . . . . .	32
Cystic Degeneration of Kidneys, . . . . .	2
Rupture of Kidneys, . . . . .	2
Ecchymoses of Psoas Muscles, . . . . .	7
Rupture of Bladder, . . . . .	1
Rupture of Spleen, . . . . .	1
Rupture of Blood Vessels within the Pelvic Cavity, attended with considerable Hemorrhage, . . . . .	2
Pleuritic Adhesions, . . . . .	2
Ecchymoses of Anterior Mediastinum, . . . . .	1

Enumeration of these morbid conditions, as regards frequency of occurrence in certain organs, may be briefly stated as follows: lungs 50, liver 22, kidneys 36, and irregularly distributed elsewhere 14. Many pertinent questions are suggested by this exhibit of traumatisms,

for instance, why is there only a single instance of injury to the spleen, while there are thirty-four of the kidneys, fifty of the lungs, etc.

Why do hemorrhagic infarctions occur so much more frequently in the lungs than in the liver? It is believed the true explanation of these and similar queries will be found in the nature of the concussive force, the point of its application, the weight and anatomical structure of the organs; and likewise their proximity or remoteness from the line along which the power is expended.

Let the force be applied to the nates, for the purpose of illustrating this idea, while the spine is maintained in the erect position, the blow thus delivered will be carried along this column, but its power will be gradually diminished, since each vertebra, with its cartilaginous articular surfaces, acts as a buffer.

The anatomical structure of the spinal column and cord and their relation to each other, and likewise to other organs, especially the brain, possess a very great interest in connection with these experiments.

The points to which attention should be especially directed are: (1) the protection afforded to the cord by the vertebral column; (2) the spinal cord and its coverings do not nearly fill the vertebral canal; (3) they are at no point adherent to or in contact with it; (4) the bony wall is everywhere cushioned with connective or adipose tissue, etc.; (5) the remaining intervening space between the bone and cord is filled with spinal fluid; (6) every vertebral nerve is so placed as to act as a most efficient stay, thus preventing any swaying or other motion. The relative points for consideration between the spinal cord and brain are: (1) the difference in the weight of these organs; (2) the contact of the membranes of the brain with the skull, etc.

The correctness of these views is supported by the results of our experiments; but it is not our intention to enter into a full consideration of these questions in this connection. The conclusion of the retrospective examination of our experiments demands in this connection, it should be merely stated that the traumatisms found on the external parts of the bodies of these animals were mostly contusions, or the result of the same, possessed no especial value besides localizing the points on which the blows were primarily received; and, therefore, have not been previously mentioned. It should be furthermore added that there are forty-one experiments in which the post-mortem and microscopical examinations failed to reveal any lesions, which are consequently to be regarded as entirely or essentially negative. The reports of these experiments may be readily found and examined by the aid of the following figures: First series—8, 12, 19, 21, 26, 27, 36, 37, 38, 39, 40 and 41. Second series—21, 23, 25, 29, 30, 33, 34, 35,



37, 39, 40, 44, 46, 49, 51, 52, 54, 56, 60, 61, 62, 68, 69, 75, 79, 82, 90, 94 and 95.

The following conclusions are based on the results of these experiments, the anatomical structure of the spinal column and cord and their relation to each other and likewise to other organs. (1) Concussive accidents never produce pathological changes in the spinal cord, except when great force has been applied to the spinal column, and these cases are generally, if not always, complicated with a fracture of the body of a vertebra, dislocation of the same, rupture or stretching of vertebral ligaments, or severe lesions in other parts of the body which terminate quickly in death.

(2) The symptoms indicative of these morbid conditions are immediately developed, rarely become intensified by reason of morbid changes occurring in the spinal cord—exceptional cases being limited to fractures and dislocations, or those in which a slow hemorrhage occurs, causing pressure on the cord.

(3) It is frequently very difficult to diagnosticate stretching of the vertebral ligaments on the living subject, and there are ample reasons for believing that this lesion is frequently overlooked in post-mortem examinations.

(4) Injuries of the spinal cord complicated with lesions of organs in the thoracic, abdominal and pelvic cavities develop symptoms dependent on the *existing complication*, and the termination of these cases rests on the character of the traumatism.

(5) Concussive force, although remotely applied, frequently results in the production of severe and even fatal traumatisms in various organs within the thoracic, abdominal and pelvic cavities.



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